

ภาคผนวก ง

เอกสารเทียบเครื่องมือ

รายการใบรับรองสอบเทียบ-ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับตรวจวัดคุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
เครื่องมือสำหรับตรวจวัดคุณภาพอากาศ									
1	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778119	UAE Consultant Co.,Ltd.	15062022	14 Jun 22	13 Jun 23	-
2	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
3	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050151	UAE Consultant Co.,Ltd.	24062022	24 Jun 22	23 Jun 23	-
4	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
5	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1191503039	UAE Consultant Co.,Ltd.	22042022	22 Apr 22	21 Apr 23	-
6	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
7	Total Hydrocarbons Analyzer	Total Hydrocarbons	Thermo Scientific	55i 1182920025	UAE Consultant Co.,Ltd.	09032022	9 Mar 22	8 Mar 23	-
8	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
เครื่องมือสำหรับตรวจวัดคุณภาพน้ำ									
1	pH Meter	pH	Hanna Instrument	HI2020-02 / C0051107	National Food Institute, Ministry of Industry, Thailand	2203135-001-01	8 Jun 22	7 Jun 23	-

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
2	pH Meter	pH	Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	2201793-001-01	1 Mar 22	28 Feb 23	-
3	BOD Incubator	Biochemical Oxygen demand (BOD)	Arco	UR-1320 / (UAE.LAB.006/2553)	Technology Promotion Association (Thailand-Japan)	22TM306	7 Apr 22	6 Apr 23	-
4	Analytical Balance (Readability 0.01 mg)	Suspended Solids Total Dissolved Solids	Mettler-Toledo	XSR205DU / C009071872	Calibration Laboratory Mettler-Toledo (Thailand) Limited	22MM210	26 Apr 22	25 Apr 23	-
5	Hot Air Oven		Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	22TM304	7 Apr 22	6 Apr 23	-
6	Digestor Unit	Total Kjeldahl Nitrogen (TKN)	FOSS TECATOR	2520auto / 91794469	Thailand Institute Of Science And Technological Research (TISTR)	2202361-001-01	4 Apr 22	3 Apr 23	-
7	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT8100 / 91889052	FOSS South East Asia	6623	25 Jul 22	24 Jul 23	-
8	Analytical Balance (Repeatability 0.1 mg)	Fat, Oil And Grease	Mettler-Toledo	XSR204 / C117635043	Mettler-Toledo (Thailand) Ltd.	2202934-001-01	13 May 22	12 May 23	-

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
9	Incubator	Fecal Coliform Bacteria <i>Escherichia coli</i> Staphylococcus aureus <i>Pseudomonas aeruginosa</i>	Binder	KB400 / 20200000015535	SPC Calibration Center Co.,Ltd.	22TM347	27 May 22	26 May 23	-
10	Incubator		Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	22TM563	7 Apr 22	6 Apr 23	-
11	Incubator		Binder	BD 53 / 13- 07343	Technology Promotion Association (Thailand-Japan)	22TM335	17 Feb 22	16 Feb 23	-
12	Incubator		Memmert	IN 75 / D317.0307	Technology Promotion Association (Thailand-Japan)	22TM671	3 May 22	2 May 23	-
13	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	22TM334	17 Feb 22	16 Feb 23	-
14	Water Bath		Memmert	WNE 14 / L414.1407	Technology Promotion Association (Thailand-Japan)	22TM565	7 Apr 22	6 Apr 23	-
15	Autoclave		ALP	CL-40L / 807298	Technology Promotion Association (Thailand-Japan)	22TM1121	11 Jul 22	10 Jul 23	-

MULTI-POINT GAS TEST REPORT

Test Date : June 24, 2022

Equipment : Gas Analyzer (NO₂) Model : 421
Manufacturer : Thermo Scientific Serial Number : CM19050151

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO) 45.35 PPM Model : 1461
Methane (CH₄) - PPM Serial Number : 1180540071
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

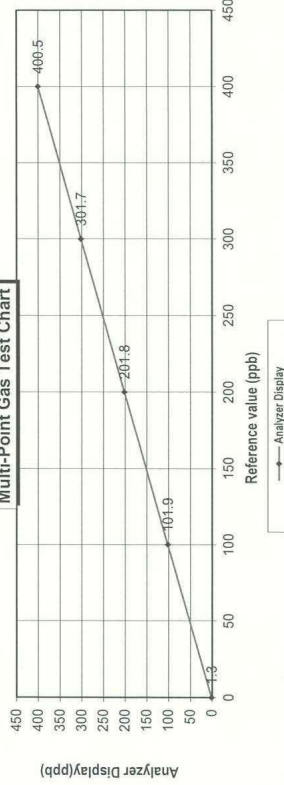
Dilutor Detail

Sulphur Dioxide (SO₂) 44.75 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO) 45.35 PPM Model : 1461
Methane (CH₄) - PPM Serial Number : 1180540071
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	1.3	1.30	1.30
Level 2 20.00%	101.9	1.90	1.86	1.86
Level 3 40.00%	201.8	1.80	0.89	0.89
Level 4 60.00%	301.7	1.70	0.56	0.56
Level 5 80.00%	400.5	0.50	0.12	0.12
Remark : Measuring Range 500.0 ppb				0.95
Acceptable Limit $\pm 5\%$				

Multi-Point Gas Test Chart



Calculate by
Sinchai Y.
24 June 2022

Approve by
Korn K.
24 June 2022

MULTI-POINT GAS TEST REPORT

Test Date : Apr 22, 2022

Equipment : Gas Analyzer (SO₂) Model : 431
Manufacturer : Thermo Scientific Serial Number : 1191503039

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO) 45.35 PPM Model : 1461
Methane (CH₄) - PPM Serial Number : 1180540071
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

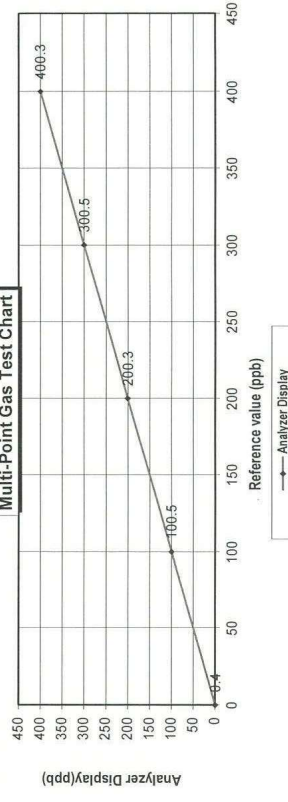
Dilutor Detail

Sulphur Dioxide (SO₂) 44.75 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO) 45.35 PPM Model : 1461
Methane (CH₄) - PPM Serial Number : 1180540071
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.4	0.40	0.40
Level 2 20.00%	100.0	100.5	0.50	0.50
Level 3 40.00%	200.0	200.3	0.15	0.15
Level 4 60.00%	300.0	300.5	0.17	0.17
Level 5 80.00%	400.0	400.3	0.07	0.07
Remark : Measuring Range 500.0 ppb				0.26
Acceptable Limit $\pm 5\%$				

Multi-Point Gas Test Chart



Calculate by
Sinchai Y.
22 Apr 2022

Approve by
Korn K.
22 Apr 2022

MULTI-POINT GAS TEST REPORT

Test Date : Mar 9, 2022

Equipment:
Manufacture:

Hydrocarbon Analyzer
Thermo SCIENTIFIC

Model :
Serial N°

55i 118

Standard Gas Concentration

Sulphur Dioxide (SO₂)

Nitric Oxide (NO)

Methane (CH_4)

Carbon Monoxide (CO)

Cylinder No. :

Expiration Date

Aug 4, 2028

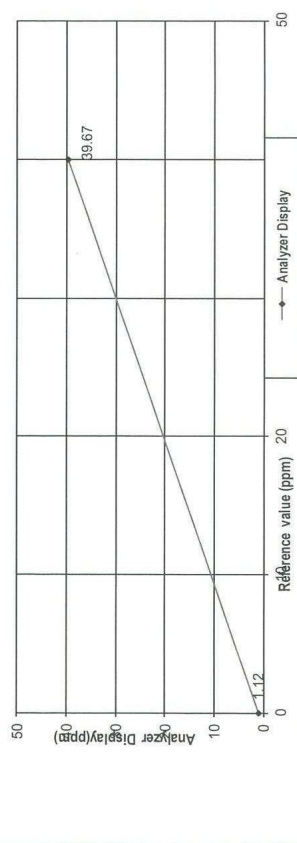
Multi-point gas test data

Reference Value (ppm)		Analyzer Display (ppm)	Difference Error	Percent Error	% Error]
Level 1	Zero	0.00			
Level 2	80.00%	40.00			
Remark : Measuring Range		50.00 ppm			
			Average	Difference (%)	0.98
			1.12	1.12	1.12
			-0.33	-0.83	0.83

Remark : Measuring Range	50.00 ppm
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Acceptable Limit $\pm 5\%$

Multi-Point Gas Test Chart



Calculate by

Calculate by
 Spieker 4.
 9.3.65

Approve by _____

Approve by _____
Polina N

 9 / Mar 2022

MULTI-POINT GAS TEST REPORT

Test Date : June 15, 2022

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201778119

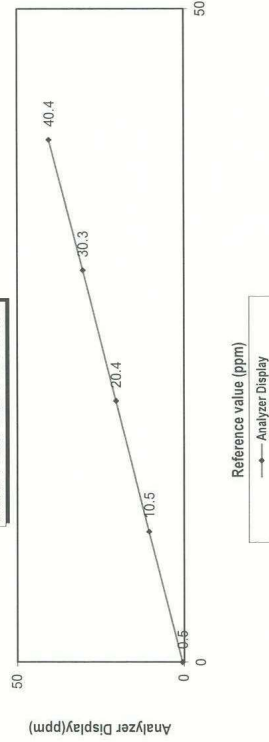
Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.75 PPM Thermo Scientific
Nitric Oxide (NO) 45.35 PPM 146i
Methane (CH₄) - PPM 1180540071
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.5	0.5	0.5
Level 2	10.0	10.5	0.5	4.8	4.8
Level 3	20.0	20.4	0.4	2.0	2.0
Level 4	30.0	30.3	0.3	1.0	1.0
Level 5	40.0	40.4	0.4	1.0	1.0
Average Difference (%)					1.84

Remark : Measuring Range 50.0 ppm
Acceptable Limit \pm 5%

Multi-Point Gas Test Chart



Calculate by

Signature :
75/06/1/65

Approve by

Signature :
76/06/1/2022

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E04N99E15A01D3
Cylinder Number: EB0143282
Laboratory: 124 - Durham (SAP) - NC
PGVP Number: B22021
Gas Code: CO, NO, NO₂, SO₂, BALN
Reference Number: 122-402135167-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Jun 21, 2021
Expiration Date: Jun 21, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800/R-12/531, using the assay procedures listed. Analytical Methodology does not include any correction factors for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	45.96 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
SULFUR DIOXIDE	45.00 PPM	44.68 PPM	G1	+/- 1.0% NIST Traceable	06/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	984.8 PPM	G1	+/- 0.7% NIST Traceable	06/14/2021
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NITRM	20081120	CC708068	49.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Feb 02, 2025
PRM	12386	D685025	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 20, 2020
GMS	401423838102	CC505581	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1	Feb 18, 2023
NITRM	16011043	CC473277	48.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 17, 2022
NITRM	14080119	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	+/-0.6%	Nov 15, 2025

The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801333 CO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO ₂	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 SO ₂	FTIR	Jun 03, 2021

Triad Data Available Upon Request

NOTES: PO #5221002807

GROSS WT: 28.40kg

NET WT: 4.73kg



The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.

Signature

Approved for Release

เอกสารไม่ควบคุม
CERT 3082.01



Calibration Certificate

Certificate No.: 2201793-001-01
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:	pH Meter
Manufacturer:	METTLER TOLEDO
Model:	SevenEasy pH
Serial No.:	1231155210
ID No.:	UAE.WAT.010/2553
Order No.:	2201793
Operation No.:	2201793-001
Date of Receipt:	21 February 2022
Date of Calibration:	1 March 2022
Calibrated by	Mr.Pheraphat Tuanjit Scientist
Date of Issue:	1 March 2022
Approved by (Mr.Nuttapol Niyomchart) (for) Specialist, Division of Calibration Laboratory 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.: 2201793-001-01
Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 1231155210
Type: Bench top
ID No.: UAE.WAT.010/2553
Date of Calibration: 1 March 2022

Page 2 of 5

Location: Chemical Calibration Laboratory, NATIONAL FOOD INSTITUTE
Environment Condition: Ambient Temperature: (23.5 ± 1.5) °C Relative Humidity: (53 ± 5) %
Condition of Equipment: Good Condition
Condition of this Results of Calibration

1. Calibration Method
2. Reference Standards / Certified Reference Material

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

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-21 F-0687	24 June 2022
2.2 Digital Thermometer	2709007	Fluke	CC-640589-01	30 October 2022
2.3 Thermo-Hygro Meter	NF.IETH-004/18	PONPE	QR22-0195	27 January 2023

Certified Reference Material	Lot. No.	Manufacturer	Ref. N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	741339	CPAchem	PH216.L5	19 April 2023
2.5 pH buffer 6.865 (Primary pH buffer Solution)	741340	CPAchem	PH217.L5	19 April 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	741342	CPAchem	PH220.L5	19 April 2022
2.7 pH buffer 7.00 (Standard pH buffer Solution)	735836	CPAchem	PH107.L5	16 March 2022

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

3.1 Instruments No.2.1	through	NSC-TSI-TIS 17025 Laboratory Accreditation of Calibration No.0075
3.2 Instruments No.2.2	through	NSC-TSI-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3	through	NSC-TSI-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 LoN 30.04.2020; BIM RefN HI-9 LoN 28.05.2020; BIM RefN HI-8 LoN 30.04.2020; BIM RefN HI-10 LoN 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.

P. Pheraphat
1 March 2022

Calibration Report

Certificate No.: 2201793-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 1 mV
Model: SevenEasy pH
Type: Bench top
Manufacturer: METTLER TOLEDO
Serial No.: 1231155210
ID No.: UAE.WAT.010/2553
Date of Calibration: 1 March 2022

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	414.117	414	0.00	0.58	2.00
2.00	295.811	296	2.00	0.58	2.00
4.00	177.462	178	4.00	0.58	2.00
6.00	59.159	59	6.00	0.58	2.00
7.00	-0.001	0	7.00	0.58	2.00
8.00	-59.159	-59	8.00	0.58	2.00
10.00	-177.463	-177	10.00	0.58	2.00
12.00	-295.812	-296	12.00	0.58	2.00
14.00	-414.119	-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: InLabSolids
Serial No.: 1156882
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	4.00	180	96.25	0.0076	2.00
6.866	6.88	16	-	0.0078	2.00
10.012	10.01	-162	96.13	0.0094	2.00
6.985	7.00	9	-	0.0097	2.00

P. Sangharatit
 1 March 2022

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2201793-001-01
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: 1 March 2022

Page 4 of 5

Location:

Chemical Calibration Laboratory, NATIONAL FOOD INSTITUTE

Environment Condition:

Ambient Temperature 24 °C ± 1 °C
 Relative Humidity 53 % ± 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	1523	2118154	PSL-T 0851/64	03-Jun-22	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 3415922

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

P. Sangharatit
 1 March 2022

เอกสารไม่ควบคุม



Calibration Report

Certificate No.:

2201793-001-01

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:

1 March 2022

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 : N/A SIN : N/A

Dimension of probe : Diameter 4 mm., Length 100 mm.,

Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.006	-0.1	0.099
25.1	25.004	-0.1	0.099
35.1	35.003	-0.1	0.099

P. Jongsakul
1 March 2022

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 -----



Cert. No.: 22TM306
Page.: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UR-1320

Serial No. :

-

ID No. : UAE.WAO.006/2553

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 : 7 April 2022

Calibration Date : 7 April 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :

Man Pattanapongpaiboon

Approved by :

Man

Approved Signatory

() Ponthippa Tameyakul

() Malee Butkruea

() Suwit Imjai

Issue Date :

18 April 2022

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.



Cert. No.: 22TM306

Condition As-Received :

Used Item

Reference : 2204-00150C-3

Result of Calibration :-

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

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	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Calibration	UUC*	UUC*	Temperature
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Point	Setting	Reading	Stability
1.00	1.00	1.00	1.00
1.01	1.01	1.01	1.01
1.02	1.02	1.02	1.02
1.03	1.03	1.03	1.03
1.04	1.04	1.04	1.04
1.05	1.05	1.05	1.05
1.06	1.06	1.06	1.06
1.07	1.07	1.07	1.07
1.08	1.08	1.08	1.08
1.09	1.09	1.09	1.09
1.10	1.10	1.10	1.10
1.11	1.11	1.11	1.11
1.12	1.12	1.12	1.12
1.13	1.13	1.13	1.13
1.14	1.14	1.14	1.14
1.15	1.15	1.15	1.15
1.16	1.16	1.16	1.16
1.17	1.17	1.17	1.17
1.18	1.18	1.18	1.18
1.19	1.19	1.19	1.19
1.20	1.20	1.20	1.20
1.21	1.21	1.21	1.21
1.22	1.22	1.22	1.22
1.23	1.23	1.23	1.23
1.24	1.24	1.24	1.24
1.25	1.25	1.25	1.25
1.26	1.26	1.26	1.26
1.27	1.27	1.27	1.27
1.28	1.28	1.28	1.28
1.29	1.29	1.29	1.29
1.30	1.30	1.30	1.30
1.31	1.31	1.31	1.31
1.32	1.32	1.32	1.32
1.33	1.33	1.33	1.33
1.34	1.34	1.34	1.34
1.35	1.35	1.35	1.35
1.36	1.36	1.36	1.36
1.37	1.37	1.37	1.37
1.38	1.38	1.38	1.38
1.39	1.39	1.39	1.39
1.40	1.40	1.40	1.40
1.41	1.41	1.41	1.41
1.42	1.42	1.42	1.42
1.43	1.43	1.43	1.43
1.44	1.44	1.44	1.44
1.45	1.45	1.45	1.45
1.46	1.46	1.46	1.46
1.47	1.47	1.47	1.47
1.48	1.48	1.48	1.48
1.49	1.49	1.49	1.49
1.50	1.50	1.50	1.50
1.51	1.51	1.51	1.51
1.52	1.52	1.52	1.52
1.53	1.53	1.53	1.53
1.54	1.54	1.54	1.54
1.55	1.55	1.55	1.55
1.56	1.56	1.56	1.56
1.57	1.57	1.57	1.57
1.58	1.58	1.58	1.58
1.59	1.59	1.59	1.59
1.60	1.60	1.60	1.60
1.61	1.61	1.61	1.61
1.62	1.62	1.62	1.62
1.63	1.63	1.63	1.63
1.64	1.64	1.64	1.64
1.65	1.65	1.65	1.65
1.66	1.66	1.66	1.66
1.67	1.67	1.67	1.67
1.68	1.68	1.68	1.68
1.69	1.69	1.69	1.69
1.70	1.70	1.70	1.70
1.71	1.71	1.71	1.71
1.72	1.72	1.72	1.72
1.73	1.73	1.73	1.73
1.74	1.74	1.74	1.74
1.75	1.75	1.75	1.75
1.76	1.76	1.76	1.76
1.77	1.77	1.77	1.77
1.78	1.78	1.78	1.78
1.79	1.79	1.79	1.79
1.80	1.80	1.80	1.80
1.81	1.81	1.81	1.81
1.82	1.82	1.82	1.82
1.83	1.83	1.83	1.83
1.84	1.84	1.84	1.84
1.85	1.85	1.85	1.85

(\mathcal{C}_H)	(\mathcal{C}_0)	(\mathcal{C}_0)	(\mathcal{C}_0)
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20.0	20.0	19.9	0.33
------	------	------	------

Calibration	Measured T
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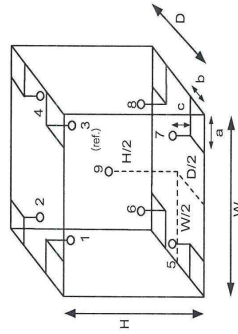
Point	P
-------	---

	1	2	3	4
(°C)				

[illegible]

20.0	20.176	20.413	19.711	19.637
------	--------	--------	--------	--------

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



Dimension of Chamber :

100

m

m

3

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

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	27
REL.Humid. (%)	59	57
AC Supply (Volt)	221	220

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 1104311



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



NIST-JTIS 7025
CALIBRATION 0088

Cert.No.: 22MM210
Page.: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : XSR205
Serial No. : C009071872
ID No. : UAE: WAO 012/2563

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

Location : Balance Room

Received order : 26 April 2022
Calibration Date : 26 April 2022
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %

Calibrated by : Kunchit Promprat

Approved by :  Approved Signatory

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

Issue Date : 29 April 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2204-0542OC-1
Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments :-

- | Instruments | Model | Serial No. | ID No. | Test report No. | Due date |
|-----------------------------|-------|------------|---------|-----------------|------------|
| 1) Standard Weight Set (E2) | 15884 | - | 70RC138 | MM-0009-21 | 3 Feb 2023 |
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on requested at the point specified by customer.
4. This certificate is not certified for any commercial transaction.
5. This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 81 g **Resolution** 0.00001 g
81 g to 220 g **Resolution** 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
80	80.00004	-0.00004	0.15	2.00
200	199.99999	+0.00001	0.35	2.00

After Adjustment :

1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight (g)	Standard Deviation of Reading (g)
80	0.000008
200	0.000005

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เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2204-05420C-1

Result of calibration

2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0002	-0.0001	0.0000	-0.0002	-0.0002	0.0002

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.00000	0.00000	0.016	2.13
0.05	0.05001	-0.00001	0.016	2.13
0.1	0.10001	-0.00001	0.017	2.11
1	1.00002	-0.00002	0.019	2.05
5	5.00003	-0.00003	0.026	2.00
20	20.00008	-0.00008	0.049	2.00
50	50.00010	-0.00010	0.080	2.00
80	80.00014	-0.00014	0.15	2.00
100	100.0001	-0.0001	0.21	2.00
150	150.0001	-0.0001	0.29	2.00
200	200.0001	-0.0001	0.35	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 %.

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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



NSC-TS17026
CALIBRATION 0008

Cert. No.: 22TM304
Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UF 55

Serial No. : B212.0411

ID No. : UAE.WAO.005/2556

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 : 7 April 2022

Calibration Date : 7 April 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

() Pornthippa Tameyakul

(☒) Malee Butkruea

() Suwit Imjai

Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

1106342

A 0040245



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2204-00150C-1

Cert. No.: 22TM304
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 MY41021843 22LM4 10 Jan 2023

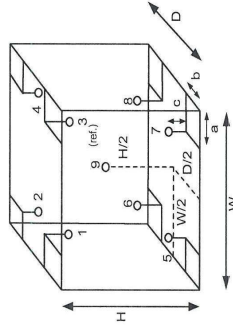
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

Dimension of Chamber :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Capacity = 0.30 m³

Wala.

เอกสารไม่ควบคุม
a 1104316



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2204-00150C-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM304
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 k
104.0	104.0	104.0	0.040	0.57	0.80	0.42	2
120.0	120.0	120.0	0.11	0.82	1.1	1.1	2
180.0	180.0	180.0	0.12	1.4	2.0	1.1	2

Measured Temperature (°C)

Calibration Point (°C)	Position	1	2	3	4	5	6	7	8	9 (ref.)
104.0		104.403	104.220	104.517	104.474	103.778	103.859	104.292	104.357	104.319
120.0		120.183	119.878	120.238	120.355	119.476	119.455	120.046	120.173	120.199
180.0		180.502	179.929	180.655	180.797	179.012	179.044	180.043	180.305	180.340

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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Wala.

เอกสารไม่ควบคุม
a 1104315

Verification Certificate

Certificate No.: 2202361-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION**Manufacturer:** FOSS**Model:** 2520**Serial No.:** 91794469**ID No.:** UAE.WAS.011/2560**Order No.:** 2202361**Operation No.:** 2202361-001**Date of Receipt:** 4 April 2022**Date of Calibration:** 4-6 April 2022**Calibrated by** Mr.Nuttapol Niyomchat
Specialist**Approved by** (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team**Date of Issue:** 11 April 2022**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.

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2202361-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 **Serial No.:** 91794469
Resolution: 1 °C **ID No.:** UAE.WAS.011/2560
Manufacturer: FOSS
Date of Calibration: 4-6 April 2022

Page 2 of 4

Location: Laboratory Room, 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:

1. This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometers 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 Type R	MY44045376/MY41194453 TC#101-103 / CH#101-103	TC21/0041	24-Apr-2022	N.M. Technical Center Laboratory

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

UUC* Description

Time of Record - Hour 30 Minute At 380 °C

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

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2202361-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 4-6 April 2022
Calibration point: 380 °C
Calibration result:

Page 3 of 4

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (± °C)	Standard Thermometer (°C)	Uncertainty (± °C)
1	380	380	0.13	376.48	1.5
2	380	380	0.12	376.58	1.5
3	380	380	0.12	376.51	1.5
4	380	380	0.14	376.70	1.6
5	380	380	0.18	376.81	1.6
6	380	380	0.12	377.23	1.6
7	380	380	0.12	377.37	1.5
8	380	380	0.13	376.68	1.5
9	380	380	0.14	376.72	1.5
10	380	380	0.18	378.97	1.6
11	380	380	0.25	378.79	1.6
12	380	380	0.11	377.14	1.6
13	380	380	0.19	379.65	1.6
14	380	380	0.16	379.61	1.6
15	380	380	0.16	378.66	1.6
16	380	380	0.15	379.18	1.6
17	380	380	0.23	377.39	1.6
18	380	380	0.11	377.71	1.6
19	380	380	0.22	376.64	1.6
20	380	380	0.16	376.56	1.6

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.

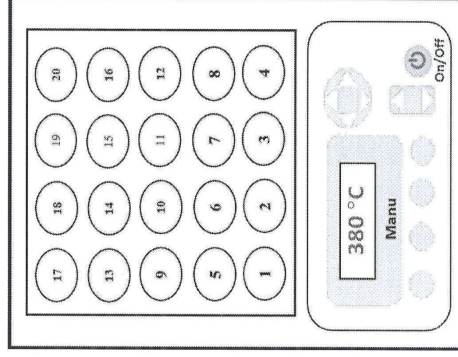
Verification Report

Certificate No.: 2202361-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 4-6 April 2022
Calibration point: 380 °C
Calibration result: Continued

Page 4 of 4

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



Sensor Installation Location

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 %.



FOSS South East Asia
3388 Sirinrat Building, 25th – 26th Floor, Unit No. 3388/90,
Rama IV Road Klongton, Klongtoey, Bangkok, Thailand 10110

FOSS South East Asia
3388 Sirinrat Building, 25th – 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton, Klongtoey, Bangkok, Thailand 10110

Customer Service Report

6623

Customer Service Report

6534

Date:	July 25, 2022
Customer:	United Analyst and Engineering
Instrument:	KT8100
Serial:	31880052

Hours	Travel To Customer		Labour		Travel From Customer	
	Start	Finish	3.00-12.00	3+3	16.30	17.30
	9.00	30 mins				
	9.30		18 13.00-16.00	± 6 hrs.		1 hrs.

Job Type					
Application		Special		Standard	
Normal	A	Courtesy Visit	X	Installation	Training
Distributor	X	PMA Onboarding	X	Quote	In House
Internal	P	Warranty	X	Repair	PM
Digital Service	A	Sales Support	X	Remote	Other

PO/Quote Number:	174913704
------------------	-----------

PMA Type	Contract No.	Application

[illegible][illegible]

I confirm this report is accurate and complete			
Signed FOSS	<i>Tranipa O.</i>	Signed Customer	<i>Dr</i>
Name	<i>Bernice Orono</i>	Name	<i>Kasiripang B. Bontipang</i>
Would you be willing to participate in a brief survey in order to tell us how we performed?		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

เอกสารไม่ควบคุม

Date:	25/7/2022
Customer:	United Analyst and Engineering
Instrument:	KT8100
Serial:	91829052
Address:	10000

Hours	Travel To Customer		Labour		Travel From Customer	
Start	9.30	0.5	9 - 12.30	6 hr	4.30	pin
Finish	9.40		1 - 4.00		5.30	

Application		Job Type			
		Special		Standard	
Normal	A	Courtesy Visit	✓	Installation	Training
Distributor	Z	PMMA Onboarding	✓	Quote	In House
Internal	X	Warranty	✓	Repair	PM
Digital Service	A	Sales Support	✓	Remote	Other

PO/Quote Number:	0000000000
-------------------------	------------

PMA Type	Contract No.	Application

Instrument Ready for Use	<input checked="" type="checkbox"/> OK	<input type="checkbox"/> Not OK	Details of Work / Test	Condition / Status
			Pressure 87726	Done
			- Software	
			- program Editor	
			- Mr Setting	
			- Manual Run	
			- User maintenance	
			- Run Blank	
			- Run Recovery	

[illegible]

I confirm this report is accurate and complete			
Signed FOSS		Signed Customer	
Name	Travis Gomez	Name	Kurphy Company
Would you be willing to participate in a brief survey in order to tell us how we performed?			Yes

เอกสารไม่ควบคุม

Kjeltec™ 8100 Distillation Unit

This IQ applies to Kjeltec™ 8100 Distillation Unit manufactured by FOSS Analytical. The installation is performed by FOSS trained service personnel.

1 Intended Use

Kjeltec 8100 is intended for laboratory use analyzing parameters as specified in FOSS Analytical AB's Application Notes.

2 Purpose

This installation Qualification is designed to assure that:

- The Kjeltec instrument is received complete, with all required parts in good condition.
- The location of the instrument is environmentally and ergonomically suitable
- The instrument is assembled and configured correctly
- Suitable electricity and water are supplied to the instrument, see table 2 for requirements.

3 Identification

Description	Serial Number
Kjeltec 8100 Distillation Unit	๑1๙ ๘9๐52

Dedicated Analytical Solutions

FOSS Analytical A/S
69 Slangerupgade
DK-3400 Hillerød
Denmark

Tel +45 7010 3370
Fax +45 7010 3371
E-mail support@foss.dk
Web www.foss.dk

FOSS Analytical AB
Box 70
SE-263 21 Höganäs
Sweden

Tel +46 42 361500
Fax +46 42 340349
E-mail support@foss.dk
Web www.foss.dk

4 Control of Received Equipment

4.1 Verify that the correct instrument type and accessory kit items are received and in proper condition

The packing list (shipped with the instrument) specifies all the items. The installer will verify that all items are received as shipped on the packing list. For each item listed, verify that the acceptance criteria are met. If so, write "Y" in the right column of the table immediately following.

Packing List Item	Acceptance Criteria	Pass/Y/(N)
Kjeltec 8100 Distillation Unit	No visible damage, received in undamaged FOSS Analytical's standard shipping container	Y
Accessory kit, according to packing list	Included. No visible damage, received in undamaged FOSS Analytical's standard shipping container	Y
Handling device for digestion tube	Included. No visible damage.	Y
Tanks with level sensors for Waste, Alkali and Water	Included. No visible damage.	Y
Receiver flask	Included. No visible damage.	Y
One digestion tube 250ml One digestion tube 100 ml	Included. No visible damage.	Y
Tube adapter	Included. No visible damage.	Y
User manual	Kjeltec 8100 Distillation Unit	Y
Owners guide	Kjeltec 8100 Distillation Unit	Y
Quick guide	Kjeltec 8100 Distillation Unit	Y
Spare parts manual	Kjeltec 8100 Distillation Unit	Y
Application notes	AN 300 included AN 303 included	Y

5 Installation

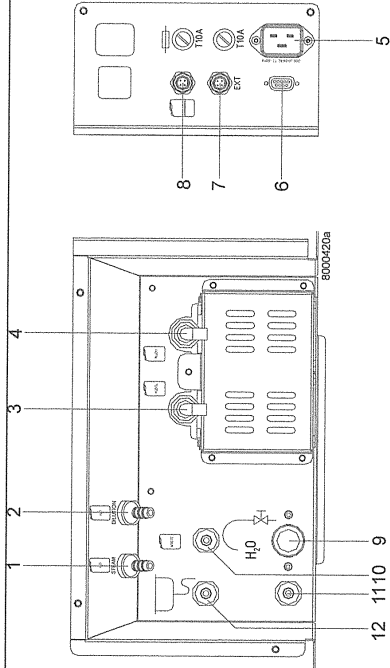
5.1 The equipment must be installed in a suitable location with power, water and draining available

Verify that the instrument installation site meets the acceptance criteria given in the table below. If so, write “Y” in the right column of the table immediately following.

Location Requirements	Acceptance Criteria	Pass (Y/N)
Adequate space for instrument	Dimensions 48x58x69 cm	Y
AC supply available for instrument	200-240 V 50/60Hz	Y
Current	10 A	Y
Cold water supply available	2 L/min at 30°C	Y
Drain	For cooling water and waste (depending on local waste disposal legislation)	Y
Ambient temperature	Max. 40°C	Y
Ambient humidity	Max. 80% relative	Y
Internal fuses	T10A AH	Y

5.2 The instrument must be assembled correctly

Verify that all tubes are correct connected. If so, write “Y” in the right column of the table immediately following.

Instrument Tubing Connections		Acceptance Criteria	Pass (Y/N)
		Visual verification by installer	Y
<div>1. Deionised water in (steam generator)</div> <div>2. Deionised water in (dilution water)</div> <div>3. *) Receiver solution in</div> <div>4. Alkali in</div> <div>5. Power</div> <div>6. Not used</div> <div>7. External titration module</div> <div>8. Level sensors</div> <div>9. Cooling water in (tap water)</div> <div>10. Waste water out (tube drain vessel)</div> <div>11. Drain</div> <div>12. Cooling water out (tap water)</div> <div>*) Only on Kjeltec 8200</div>			

5.3 The instrument should be assembled and powered up

Connect the distilling unit to the power supply. Perform the start up procedure and check that the expected response is obtained. If so, write "Y" in the right column of the table immediately following.

Action	Expected Response	Pass (Y/N)
Switch on the power	The instruments start up and the self test will run. The sample counter shows the number of analysed samples since first power and the Software Version shows the version of the instruments software.	Y
Turn on the cold water tap	After start-up, Program 1 is loaded and the Analyse menu is displayed.	Y
Press the "Manual" view	No visible reaction	Y
Open the door with the handle, place the test tube and receiver flask in position. Close the door.	The Manual menu is opened	Y
Select Dilution and press Start	Water is added to the tube	Y
Select Alkali and press Start	Alkali is added to the tube	Y
Select Steam and press start	After heating up, steam is entering the tube	Y
Select Drain and press Start	The tube is drained	Y

6 Summary of Deviations/Comments

Deviations from above requirements are specified below and any corrective actions are noted.

Deviation	Action	Comment

7 IQ Documentation

Upon successful completion and recording of all instructions above, sign and date this sheet below. If required by customer, leave one signed copy with instrument.

If customer's internal procedures require further reporting or witnessing of results, execute those procedures as required.

Installed By: Pannipa Ohnom

Company: Foss SEA

Customer Name: United Analyst and Engineering

Company: United Analyst and Engineering

Date completed: July 25, 2022

Kjeltec™ 8100 Distillation Unit

This OQ applies to Kjeltec 8100 Distillation Unit manufactured by FOSS Analytical. The operation qualification is performed by FOSS trained service personnel.

1 Intended Use

Kjeltec 8100 is intended for laboratory use analyzing parameters as specified in FOSS Analytical Application Notes.

2 Purpose

This procedure is designed to test the function of the instrument according to factory test specifications:

- Alkali volume
- Distillation Accuracy
- Distillation Repeatability

3 Identification

Description	Serial Number
Kjeltec 8100 Distillation Unit, 200-240 V 50/60 Hz	9189052

Dedicated Analytical Solutions

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69 Slangerupgade
DK-3400 Hillerød
Denmark
Tel +45 7010 3370
Fax +45 7010 3371
E-mail support@foss.dk
Web www.foss.dk

FOSS Analytical AB
Box 70
SE-263 21 Höganäs
Sweden
Tel +46 42 361500
Fax +46 42 340349
E-mail support@foss.dk
Web www.foss.dk

4 Performance

4.1 Verify the dispensed volumes of reagents

Note! To verify the dispensed volumes of reagents a triple test should be done to be statistic correct. Then calculate a mean value.

1. Choose "Manual" in the menu. (When starting up the instrument Program 1 is loaded)
2. Open the safety door by pressing **Open** and place a tube in the instrument. Close the safety door.

Water

1. Press **Dilution** and then press **Start**. 80 ml of water will be filled into the tube.
2. Measure the collected water in a graduated measuring glass and note the result in table 1 below.
3. Check acceptance criteria in the table and make the judgment if passed or not.

Note! If the water volume needs to be calibrated, go to 4.8.5 Dilution Pump Calibration in the User Manual.

Alkali

1. Press **Alkali** and then press **Start**. 50 ml of alkali will be filled into the tube.
2. Measure the collected alkali in a graduated measuring glass and note the result in table 1 below.
3. Check acceptance criteria in the table and make the judgment if passed or not.

Table 1 Volume control

Test	Result	Expected result	Passed (Y/N)
Water volume	$\frac{83}{83}$ ml $\frac{82}{82}$ ml Mean $\frac{82.67}{82.67}$ ml	76- 84 ml	Y
Alkali volume	$\frac{52}{52}$ ml $\frac{53}{53}$ ml Mean $\frac{52.33}{52.33}$ ml	47- 54 ml	Y

4.2 Verify the distillation procedure, accuracy and precision

The distillation principle is to convert ammonium (NH₄⁺) into ammonia (NH₃) by using an alkali (NaOH) and thereafter steam distill it into a receiver flask containing boric acid and titrate with standard acid solution using colorimetric end-point detection. Ammonium sulphate, a substance with known ammonia content, can be used to check the accuracy of the distillation. The recovery is calculated from obtained result.

The way to perform this test will be described in the following.

Chemical Check

Use ammonium sulphate (NH₄)₂SO₄, purity > 99.5 % *)

Mol. weight = 132.14 g/mol, Nitrogen content in ammonium sulphate (99.5 %) = 21.09% *)

Analysis conditions according to AN 300

Water	80 ml
Alkali	50 ml NaOH (40%w/w)
Receiver solution	30 ml boric acid (4%)
Distillation time	5 minutes
SAFE	5 seconds
Titrant	0.2N HCl

For reagent preparation see Appendix A

1. Start the instrument and run two blanks without chemicals according to above analysis conditions, distill into a receiver flask containing boric acid. Titrate with a standard acid solution using colorimetric end-point detection. If the blanks are less than 0.2 ml continue with the recovery tests:
2. Weigh 0.15 g ammonium sulphate into a tube. Prepare 6 samples (tubes).
3. Run the six samples according to above analysis conditions. Titrate with a standard acid solution using colorimetric end-point detection.
4. Calculate the recovery according to below equations. Expected results of recovery should be 100%±1%.

Recovery test	Result	Expected result	Passed (Y/N)
Blank value (water blank)	1. 0.03 ml 2. 0.19 ml	0.05-0.20 ml	Y
Recovery	1. 100.70 % 2. 100.30 % 3. 100.63 % 4. 99.01 % 5. 99.97 % 6. 100.01 %		
Accuracy	Mean Value: 100.03	99-101%	Y
Precision	SD: 0.557	SD <1%	Y

*) Note! Please also note that the below calculations must be adjusted if other purity levels of ammonium salts are used. A certificate for the chemical supplier should be available

Purity	Nitrogen content
99.5%	21.09% ✓
99.6%	21.12%
99.7%	21.14%
99.8%	21.16%
99.9%	21.18%

$$\% \text{ Nitrogen} = \frac{(ml_{\text{sample}} - ml_{\text{blank}}) \times N \times 14,007 \times 100}{mg_{\text{sample}}}$$

0.1095
21.72

N = Normality of titrant to 4 places of decimal.

$$\% \text{ Recovery} = \frac{\% \text{ Nitrogen}}{21.09} \times 100$$

mg sample

0.1592 23.56

- 1
- 2
- 3
- 4
- 5
- 6

5 Summary of Deviations/Comments

Deviations from above requirements are specified below and any corrective actions are noted.

Deviation	Action	Comment

6 OQ Documentation

Upon successful completion of tests above, sign and date this sheet below. If required by customer, leave one signed copy with instrument.

If customer's internal procedures require further reporting or witnessing of results, execute those procedures as required.

Performed By: _____

Company: _____

Customer Name: _____

Company: _____

Date completed: _____

7 Appendix A

7.1 Preparation of Reagents

7.1.1 Alkali

To convert ammonium into ammonia an excess of sodium hydroxide is necessary.

Use 400 g NaOH per litre of solution. Commercially available in concentrations up to 50 %. Do not use concentrations above 40 % as this will lead to crystal formation impairing the function of the pumps. If you can only buy concentrations > 40 %, dilute it before use.

7.1.2 Titrant acid, determination of concentration

To be able to achieve accurate nitrogen / protein results, one must be quite sure that the HCl (hydrochloric acid) concentration is what it is supposed to be. A titration against a predetermined solution of sodium carbonate as described below is thus necessary. Incorrect HCl concentration can otherwise cause substantial errors.

Standard substance

Weigh approx. 10 g of anhydrous sodium carbonate (Na₂CO₃). Use a mortar to make a fine powder. Dry it for 1 h at 265 °C or 2 h at 200 °C. After cooling in a desiccator, transfer the sodium carbonate to a beaker with a tight lid. Store it in a desiccator.

Indicator solutions

Dissolve 0.1 g methyl red in 100 ml methanol. Dissolve 0.1 g bromocresol green in 100 ml methanol.

Procedure

Weigh approx. 0.4 g of the standard substance, using an analytical balance, note the weight (W₁). Transfer the sodium carbonate to a receiver flask and add 40 ml of H₂O (distilled or deionized). Add 8 drops from each of the indicator solutions. Titrate to pink. Note the amount in ml used (A₁). Boil this solution for a few minutes. The solution will turn green. Cool rapidly to room temperature under running water. Continue the titration until the next pink colour change occurs. Note also this volume

(A₂). Boil the solution for a few minutes. Cool rapidly to room temperature under running water. Continue the titration until the next pink colour occurs. Note also this volume (A₃)

Note! Temperature changes will influence the volume and the concentration of the titrant solution. The working temperature of the titrant should approximate that of its temperature during standardization. If temperature corrections are necessary, sufficient accuracy may be obtained by use of a correction table. (AOAC 942.25)

7.2 Calculation

$$Molarity (M) = \frac{18.870 \times W_1}{(A_1 + A_2 + A_3)}$$

Note! Concentration must be accurate to four digits, i.e. 0.2000 M.

Note! The colour change of this official procedure (AOAC 936.15) may be difficult to see, therefore a pH meter or a mixed indicator (e.g. 0.1 g Methyl red and 0.1 g Bromocresol green in 100 ml methanol) will make it much easier to perform.

7.3 Receiver Solution

Boric acid 4 % with bromocresol green / methyl red indicator solution

In order to obtain accurate results the receiver solution is adjusted so that a small (0.05-0.20 ml) positive blank is obtained when running a blank sample. The 4 % boric acid receiver solution is prepared by dissolving 400 g of boric acid in about 5-6 l very hot deionized water. Mix and add more hot deionized water to a volume of about 9 l. Cool the solution to room temperature and add 100 ml of bromocresol green solution (100 mg in 100 ml methanol) and 70 ml of methyl red solution (100 mg in 100 ml of methanol). Dilute to 10 l with deionized water and mix carefully.

Note! The addition of alkali is to achieve a positive blank value. This should, however, be kept between 0.05 - 0.20 ml titrant, to obtain good repeatability when testing blanks.

Adjustment of the boric acid is made by the following procedure:

1. Transfer 25 ml boric acid solution to a receiver flask and add 100 ml of distilled water. If the solution in the flask is still red, titrate with 0.1 M sodium hydroxide solution until a neutral grey colour is obtained. Calculate the amount of sodium hydroxide solution necessary to adjust the boric acid solution in the 10 l flask with the formula: ml 1.0 M alkali = ml titrant x 40
2. Add the calculated amount of 1.0 M alkali solution to the boric acid solution. Mix.
3. To check proceed as follows using 25 ml of the boric acid solution. Run a blank. If the value of this blank is high (0.5 ml of 0.2 M HCl) the boric acid is incorrectly adjusted. This might create irregular blanks. For correction add HCl directly into the boric acid tank, mix it carefully and repeat until a reading of 0.05 - 0.20 ml HCl is obtained. If a positive blank is not achieved, add further small quantities of 1 M NaOH and repeat the check until a satisfactory value is achieved.

FOSS Performance Qualification

Kjeltec™ 8100 Distillation Unit Tecator™ 2508/2520 Digestor

1 Scope

This PQ applies to the Digestion system 2508/2520 (including exhaust and scrubber unit) and Kjeltec 8100 Distillation Unit manufactured by FOSS Analytical. The user of the instrument performs the PQ.

2 Intended Use

The Digestion system (including exhaust and scrubber) and Kjeltec 8100 Distillation Unit are intended for laboratory use analyzing parameters as specified in FOSS Application Notes.

3 Purpose

The guidelines are intended to assist the user in successfully developing Performance Qualifications for the specific application(s) to which the instrument is applied.

The Performance Qualification (PQ) includes the process of demonstrating that the Digestion system 2508/2520 (including exhaust and scrubber unit) and the Kjeltec 8100 Distillation unit consistently perform according to a specification appropriate for its routine use. Main activities in the PQ phase are:

- Preventive maintenance
- On-going verification tests

This document suggests routines to fulfill the requirements for an acceptable PQ but the final procedure should be adapted to local routines for similar equipment.

4 Definition of Test Procedures

4.1 Preventive Maintenance

Maintenance of the Kjeltec 8100 should be performed according to the instructions in manual, see User Manual Kjeltec 8100/8200 Distillation Unit, chapter 5. Maintenance. A yearly service is recommended (service agreement).

Maintenance of the Digestion block (including exhaust and scrubber) should be performed according to instruction in the user manual, see User Manual Tecator Digestor, chapter 5. Maintenance.

Dedicated Analytical Solutions

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4.2 Ongoing Qualification Tests

Block Temperature

The temperature for the digestion is limited by the boiling point for the sulphuric acid, this can be increased by adding a salt (K_2SO_4) to the digestion mixture. It's important that the optimal ratio between acid and salt is kept; please follow recommendation in AN 300 or suggested procedures for a specific kind of sample material.

The block temperature itself can be controlled external by inserting a temperature probe in the intended hole in the aluminium block (front row of holes).

Use the reagents and method procedure specified in AN 300. Use only reagents of recognized analytical grade, unless otherwise specified and distilled or demineralised water of water of equivalent purity.

Suggested standard material for internal quality control:

Ammonium sulphate $[(NH_4)_2SO_4]$, min. 99.5 % (mass fraction), with certified purity.

Note: The above chemical is usually readily available with a certificate specifying the purity.

Alternatively ammonium iron(II) sulphate, $(NH_4)_2 Fe (SO_4)_2 \times 6 H_2O$, with certified purity may be used.

Tryptophan ($C_{11}H_{12}N_2O_2$), minimum assay 99 % (mass fraction). Nitrogen content 137.2 g/kg. Do not dry in an oven before use.

Acetanilide (C_8H_9NO), minimum assay 99 % (mass fraction). Nitrogen content 103.6 g/kg. Do not dry in an oven before use.

Sucrose, ($C_{12}H_{22}O_{11}$), with a nitrogen content of not more than 0.002 % (mass fraction). Do not dry in an oven before use.

Blank Tests

Carry out a blank test following the currently used procedure for digestion, distillation and titration taking 2 ml of water and about 0.7 g of sucrose instead of the test portion. Keep a record of blank values. If blank values change, identify the cause.

Note: The amount of titrant used in the blank test should always be greater than 0.0 ml. Blanks within the same laboratory should be consistent across time.

4.3 Recovery Tests

Regularly run recovery studies to check the accuracy of procedure and equipment:

- Nitrogen loss* - Use 0.12 g ammonium sulphate and 0.67 g sucrose per flask weighted to the nearest 0.1 mg. Add all other reagents as stated in the method currently used (Kjeltech, H_2SO_4 , etc). Digest and distil under same conditions as for sample. Recoveries shall be >99 %.
- Digestion efficiency* - Use a test portion of minimum 0.15 g of tryptophan or acetanilide and 0.67 g sucrose per flask weighted to the nearest 0.1 mg. Determine the nitrogen content according to the current procedure in use. The recoveries of tryptophan shall be >98.5 %; the recoveries of acetanilide shall be >99.5 %.
- Distillation and titration efficiency* – Distil 0.10 – 0.15 g ± 0.0001 g ammonium sulphate, omitting the digestion step. The recoveries should be >99.5 %.

Note: Results less than 98.5 % or more than 101.0 % in either of the recovery tests indicate failures in the procedure and/or inaccurate concentration of the standard volumetric hydrochloric acid solution (should be adjusted to four decimals accuracy according to procedure in AN 300)

External Quality Control Program

It is recommended to participate in an external quality control program, such a proficiency program or ring test, with equivalent sample material as analysed within the laboratory.

Calculation and Expression of Results

$$w_n = \frac{14,007(V_s - V_b)N \times 100\%}{m}$$

Where:

w_n is the nitrogen content of the sample, expressed as a percentage by mass.

V_s is the numerical value of the volume of the hydrochloric acid standard volumetric solution) used in the sample test, in milliliters, expressed to the nearest 0.05 ml.

V_b is the numerical value of the volume of the hydrochloric acid standard volumetric solution used in the blank test, in milliliters, expressed to the nearest 0.05 ml.

N is the numerical value of the exact normality of the hydrochloric acid standard volumetric solution, expressed to four decimal places.

m is the numerical value of the mass of the test portion , in milligrams, expressed to the nearest 1 mg for sample weights >1 g or to the nearest 0.1 mg for sample weights <1 g.

5 Maintenance

5.1 Maintenance Kjeltec™ 8100

See instructions in User Manual - Kjeltec 8100/8200, chapter 5 Maintenance.

5.2 Maintenance Tecator™ Digestor

See instructions in User Manual - Tecator Digestor, chapter 5 Maintenance.

6 The Maintenance Record Charts

This record charts are provided to assist you in keeping your system in good working order. Please make copies and use them regularly as they can often help us to help you in the unlikely event a system malfunction.

เอกสารไม่ควบคุม

[illegible]

เอกสารไม่ควบคุม

[illegible]

6.2 FossCare™ Customer Log

6.2.1 Daily Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Steam Cleaning															
Cleaning of Drip Tray, Tube Support and Safety Door															
Cleaning of Tube Adapter															
Cleaning from Spillage															
Check of Sample Racks															
Signature															
Number of analyses															

ពេលវេលាដែលគួរត្រួតពិនិត្យ

6.2.2 Weekly Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Check of Safety Functions															
Check of Reagent Tanks															
Check of Digestion Tubes															
Signature															
Number of analyses															

ពេលវេលាដែលគួរត្រួតពិនិត្យ

6.2.3 Every 1-3 Months Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Cleaning of Alkali Pump															
Cleaning of Splash Head															
Cleaning of Receiver Solution Dispensing System															
Check of Tube Adapter															
Signature															
Number of analyses															

เอกสารนี้เป็นเอกสาร

6.2.4 Additional Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Cleaning of Steam Generator															
Signature															
Number of analyses															

เอกสารนี้เป็นเอกสาร

เอกสารไม่ควบคุม

[illegible]

เอกสารในควมคุม

[illegible]

Calibration Report

Certificate No.: 2202934-001-01

Equipment: Electronic Balance

Model: XSR204

Serial No.: C117635043

Capacity: 220 g

Date of Calibration: 13 May 2022

Environment Condition:			
Ambient Temperature	22.3 ± 0.1 °C	Relative Humidity:	47 ± 3 %

Place of Calibration: Balance room (Water Analysis Unit), 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:

<u>Reference Standard</u>	<u>Model</u>	<u>Serial No</u>	<u>Calibrated By</u>	<u>Certificate No.</u>	<u>Due Date</u>
Standard Weight Class E2	1mg to 200g	B505567572	TCS	M22041375	23 April 2023
<u>Instrument</u>	<u>Model</u>	<u>Serial No</u>	<u>Calibrated By</u>	<u>Certificate No.</u>	<u>Due Date</u>
Thermo-Hygro Meter	PONPE 490	NFL15TH 010/18	Quality Reborn	QR22-0350	18 February 2023

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:

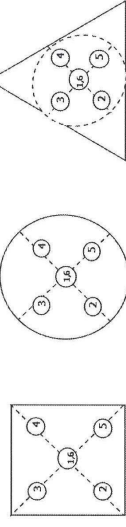
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000033
200	0.000032

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
(g)	(g)	(g)	(g)	(g)	(g)
50 000	50 000	50 000	50 000	50 000	50 000
					0 000

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2202934-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.WAS.012/2564
Serial No.: C117635043
Capacity: 220 g

Page 3 of 4

Date of Calibration: 13 May 2022

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 k
Unload	0.00000	0.0000	0.0000	0.000085	2.00
0.01	0.01000	0.0100	0.0000	0.000085	2.00
0.02	0.02000	0.0200	0.0000	0.000085	2.00
0.05	0.05000	0.0500	0.0000	0.000085	2.00
0.1	0.10001	0.1000	0.0000	0.000085	2.00
0.2	0.20001	0.2000	0.0000	0.000085	2.00
0.5	0.50002	0.5000	0.0000	0.000085	2.00
1	1.00001	1.0000	0.0000	0.000086	2.00
2	2.00003	2.0000	0.0000	0.000086	2.00
3	3.00004	3.0000	0.0000	0.000087	2.00
5	5.00002	5.0000	0.0000	0.000087	2.00
10	10.00001	10.0000	0.0000	0.000088	2.00
20	20.00004	20.0000	0.0000	0.000092	2.00
30	30.00005	30.0001	-0.0001	0.00010	2.00
40	40.00008	40.0001	0.0000	0.00011	2.00
45	45.00010	45.0001	0.0000	0.00013	2.00

F-CS-012 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2202934-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.WAS.012/2564
Serial No.: C117635043
Capacity: 220 g

Page 4 of 4

Date of Calibration: 13 May 2022

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 k
50	50.00004	50.0001	-0.0001	0.00011	2.00
55	55.00006	55.0001	0.0000	0.00012	2.00
60	60.00005	60.0001	-0.0001	0.00012	2.00
65	65.00007	65.0002	-0.0001	0.00013	2.00
70	70.00008	70.0002	-0.0001	0.00013	2.00
75	75.00010	75.0002	-0.0001	0.00013	2.00
80	80.00009	80.0002	-0.0001	0.00014	2.00
85	85.00011	85.0002	-0.0001	0.00014	2.00
90	90.00012	90.0002	-0.0001	0.00015	2.00
100	100.00008	100.0003	-0.0002	0.00016	2.00
120	120.00011	120.0003	-0.0002	0.00018	2.00
150	150.00012	150.0004	-0.0003	0.00021	2.00
200	200.00015	200.0004	-0.0003	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 -----

F-CS-012 Revision: 01 Date: 20-04-65





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.: 22TM347
Page.: 1 of 3

Certificate of Calibration

Equipment : Cooled Incubator

Manufacturer : Binder

Model : KB 400 E6

Serial No. : 20200000015535

ID No. : UAE.MIC.018/2564

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

Location : Microbiology Laboratory

Received Order : 27 May 2022

Calibration Date : 27 May 2022

Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$

Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Suwit Injai

Approved by :

() Pornthippa Tameyakul
() Malee Butkruea

Approved Signatory

Issue Date :

2 June 2022

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 Service

เอกสารควบคุม



Equipment : Cooled Incubator
Condition As-Received : Used Item
Reference : 2205-07640C-1
Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date
1) Data Acquisition 34970A 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.

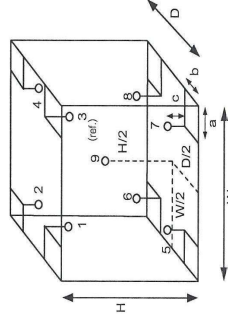
Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Fan Setting : 100.0%

Environment during calibration		
	Beginning	Finished
Temp. ($^\circ\text{C}$)	21	21
REL-Humid. (%)	67	65
AC Supply (Volt)	233	234



Probe Installation Details :

a = 10 cm D = 0.48 m
b = 10 cm W = 0.65 m
c = 14 cm H = 1.3 m
Capacity = 0.40 m³

Dimension of Chamber :

Position :	Ref. Std. ID No.:
1	15RTD2/11
2	15RTD2/12
3	15RTD2/13
4	15RTD2/14
5	15RTD2/15
6	15RTD2/16
7	15RTD2/17
8	15RTD2/18
9 (ref.)	15RTD2/19

Cert. No.: 22TM347
Page.: 2 of 3

เอกสารควบคุม



Equipment : Cooled Incubator
Condition As-Received : Used Item
Reference : 2205-0764OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

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	34.9	34.9	0.017	0.31	0.38	0.30	2

Measured Temperature (°C)								
Calibration Point (°C)	Position							
	1	2	3	4	5	6	7	8
35.0	34.808	35.139	34.922	35.062	35.109	35.161	35.132	35.129
								9 (ref.)
								35.092

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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NSC-TS-71817025
CALIBRATION 0008

Cert. No.: 22TM347
Page.: 1 of 3

Certificate of Calibration

Equipment : Cooled Incubator

Manufacturer : Binder

Model : KB 400 E6

Serial No. : 20200000015535

ID No. : UAE.MIC.018/2564

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

Location : Microbiology Laboratory

Received Order : 27 May 2022

Calibration Date : 27 May 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Suwit Injai

Approved by :

(/) Ponthippa Tameyakul
(/) Malee Butkruea

Approved Signatory

Issue Date : 2 June 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารควบคุม

เอกสารควบคุม



Equipment : Cooled Incubator
Condition As-Received : Used Item
Reference : 2205-0764OC-1
Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

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

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

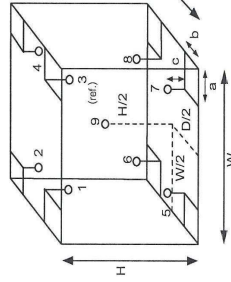
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Fan Setting : 100.0%



Probe Installation Details :

Dimension	Value
a	10 cm
b	10 cm
c	14 cm
D	0.48 m
W	0.65 m
H	1.3 m
Capacity	0.40 m ³

เอกสารควบคุม



Equipment : Cooled Incubator
Condition As-Received : Used Item
Reference : 2205-0764OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
35.0	34.9	34.9	0.017	0.31	0.38	0.30	2

Calibration Point (°C)	1	2	3	4	5	6	7	8	9 (ref.)
35.0	34.808	35.139	34.922	35.062	35.109	35.161	35.132	35.129	35.092

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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เอกสารควบคุม



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Cert. No.: 22TM347
Page.: 1 of 3

Certificate of Calibration

Equipment : Cooled Incubator

Manufacturer : Binder

Model : KB 400 E6

Serial No. : 20200000015535

ID No. : UAE.MIC.018/2564

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

Location : Microbiology Laboratory

Received Order : 27 May 2022

Calibration Date : 27 May 2022

Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$

Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Suwit Injai

Approved by :

() Ponthippa Tameyakul
() Malee Butkruea

Approved Signatory

Issue Date :

2 June 2022

The Uncertainties are for a confidence probability of approximately 95 %

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Equipment : Cooled Incubator
Condition As-Received : Used Item
Reference : 2205-07640C-1
Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date
1) Data Acquisition 34970A 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.

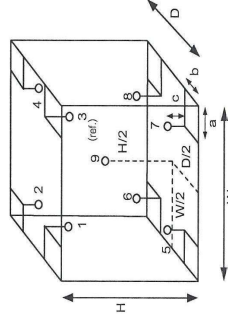
Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Fan Setting : 100.0%

Environment during calibration		
	Beginning	Finished
Temp. ($^\circ\text{C}$)	21	21
REL-Humid. (%)	67	65
AC Supply (Volt)	233	234



Probe Installation Details :

a = 10 cm D = 0.48 m
b = 10 cm W = 0.65 m
c = 14 cm H = 1.3 m
Capacity = 0.40 m³

Dimension of Chamber :

Position :	Ref. Std. ID No.:
1	15RTD2/11
2	15RTD2/12
3	15RTD2/13
4	15RTD2/14
5	15RTD2/15
6	15RTD2/16
7	15RTD2/17
8	15RTD2/18
9 (ref.)	15RTD2/19

เอกสารควบคุม



Equipment : Cooled Incubator
Condition As-Received : Used Item
Reference : 2205-0764OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

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	34.9	34.9	0.017	0.31	0.38	0.30	2

Measured Temperature (°C)								
Position								
1	2	3	4	5	6	7	8	9 (ref.)
35.0	34.808	35.139	34.922	35.062	35.109	35.161	35.132	35.092

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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MSC-TS-1517026
CALIBRATION 0008

Cert. No.: 22TM671
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 (302)

Received Order : 3 May 2022

Calibration Date : 3 May 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by : 
Approved Signatory

(/) Ponthippa Tameyakul

(/) Malee Butkruea

(/) Suwit Imjai

Issue Date : 10 May 2022

The Uncertainties are for a confidence probability of approximately 95 %

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เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-2
Cert. No.: 22TM671
Page.: 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

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

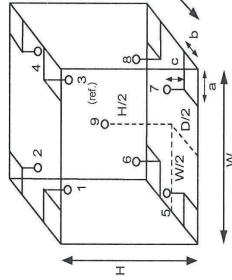
2. This certificate is valid only to the item calibrated on date and place of calibration.

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



Probe Installation Details :

a =	5.0	cm	D =	0.32	m
b =	5.0	cm	W =	0.42	m
c =	5.0	cm	H =	0.56	m
			Capacity =	0.075	m ³

Dimension of Chamber :

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	23
REL.Humid. (%)	55	59
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	19-15RTD-01
2	19-15RTD-02
3	19-15RTD-03
4	19-15RTD-04
5	19-15RTD-05
6	21-15RTD-06
7	19-15RTD-07
8	19-15RTD-08
9 (ref.)	19-15RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-2
Cert. No.: 22TM671
Page.: 3 of 3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
36.0	36.0	36.0	0.058	0.29	0.49	0.30	2

Measured Temperature (°C)								
Position								
1	2	3	4	5	6	7	8	9 (ref.)
36.031	36.035	36.008	36.063	35.621	35.716	35.618	35.778	35.798

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



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NSC-TS1-TS17025
CALIBRATION 0008

Cert. No.: 22TM334
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 : 17 February 2022

Calibration Date : 17 February 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Suwit Imjai

Approved by :  Approved Signatory

(/) Ponthippa Tameyakul
(/) Malee Butkruea

Issue Date : 22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0038095



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-4

Cert. No.: 22TM334
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:-

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

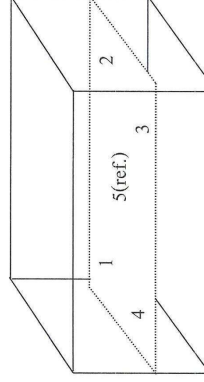
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply (Volt)
	(°C)	(%R.H.)	
Beginning of Calibration	21	65	229
Finished of Calibration	22	57	230



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม

A 1096055



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-044OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM334
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	44.572	44.514	44.507	44.530	44.565

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
44.5	0.10	0.042	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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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Cert. No.: 22TM565
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
Microbiology Laboratory

Received Order : 7 April 2022
Calibration Date : 7 April 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Prawit Sodavitchit

Approved by : 
Approved Signatory

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

Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95 %

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เอกสารไม่ควบคุม

a 1096054



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2204-0016OC-4
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:-

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

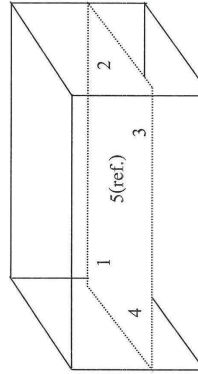
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply (Volt)
	(°C)	(%R.H.)	
Beginning of Calibration	26	62	220
Finished of Calibration	26	65	220



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2204-0016OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM565
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.424	44.409	44.478	44.470	44.581

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.22	0.039	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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เอกสารไม่ควบคุม



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



Cert. No.: 22TM1121
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
301 Room
Location :

Received Order : 11 July 2022
Calibration Date : 11 July 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Preecha Hlahib

Approved by : 
Approved Signatory

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

Issue Date : 18 July 2022
The Uncertainties are for a confidence probability of approximately 95 %

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เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2207-02450C-7
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:-

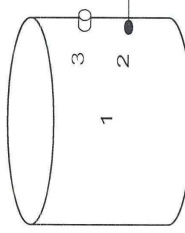
Instrument **Model** **Serial No.** **Cert. No.** **Due Date**
1) Data Acquisition 34970A MY44060450 22LM46 28 Mar 2023
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.
4. This result of 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	29	49
Finished of Calibration	32	48
		220

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	22-14TC-01
2 =	Temperature sensor	22-14TC-02
3 =	Exhaust port	22-14TC-03

เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2207-0245OC-7
Cert. No.: 22TM1121
Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 115 °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	116.523	0.14	0.08	0.90	2
		2	116.566				
		3	116.440				

Operating parameter Set : Temperature = 121 °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	122.503	0.19	0.12	0.91	2
		2	122.637				
		3	122.558				

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



มูลนิธิสถาบันพัฒนาอุตสาหกรรมอาหาร
ศูนย์บริการทางวิชาการด้านอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center
Ministry of Industry

Calibration Certificate

Certificate No.: 2203135- 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: pH Meter
Manufacturer: HANNA INSTRUMENTS
Model: HI2020-02
Serial No.: C0051107
ID No.: UAE.WAO.005/2557
Order No.: 2203135
Operation No.: 2203135-001
Date of Receipt: 7 June 2022
Date of Calibration: 8 June 2022

Calibrated by Mr.Manas Somsak Specialist
Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 13 June 2022

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.

F-CS-009 Revision: 01 Date: 20-04-65

2008 สถาบันมาตรวิทยา 36 ถนนสุขุมวิท กรุงเทพมหานคร เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 36, Aun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8568 Fax: +66(0) 2422 8545



เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2203135-001-01

Equipment:

pH Meter

Resolution: 0.01 pH ; 0.1 mV

Manufacturer: HANNA INSTRUMENTS

Model: HI2020-02

Serial No.: C0051107

Type: Bench top

ID No.: UAE.WAO.005/2557

Date of Calibration:

8 June 2022

Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute

Environment Condition: Ambient Temperature: (23.5 ± 1.5) °C

Relative Humidity: (53 ± 5) %

Condition of Equipment: Good Condition

Condition of this Results of Calibration

1. Calibration Method In house method : W-CO-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-21F-0687	24 June 2022
2.2 Digital Thermometer	2709007	Fluke	CC-640699-01	30 October 2022
2.3 Thermo-Hygro Meter	NFLBTH0051/8	PONPE	QR22-0351	18 February 2023
Certified Reference Material	Lot. No.	Manufacturer	Ref N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	805203	CPAchem	PH216.L5	21 April 2024
2.5 pH buffer 6.865 (Primary pH buffer Solution)	805204	CPAchem	PH217.L5	21 April 2024
2.6 pH buffer 10.01 (Primary pH buffer Solution)	805205	CPAchem	PH220.L5	21 April 2023
2.7 pH buffer 7.00 (Standard pH buffer Solution)	805206	CPAchem	PH107.L5	21 April 2023

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

- 3.1 Instruments No.2.1 through
- 3.2 Instruments No.2.2 through
- 3.3 Instruments No.2.3 through
- 3.4 Certified Reference Material No. 2.4 to 2.6 traceable to

3.5 Certified Reference Material No.2.7 traceable to
BIM Ref N HI-27 LoIN 04.06.2021; BIM Ref N HI-28 LoIN 28.05.2021;
BIM Ref N HI-27 LoIN 04.06.2021; BIM Ref N HI-28 LoIN 28.05.2021;
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.

Handwritten signature

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2203135-001-01

Equipment:

pH Meter

Resolution: 0.01 pH ; 0.1 mV

Manufacturer: HANNA INSTRUMENTS

Model: HI2020-02

Serial No.: C0051107

Type: Bench top

ID No.: UAE.WAO.005/2557

Date of Calibration:

8 June 2022

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	414.117	415.9	0.00	0.063	2.00
2	295.811	297.5	2.00	0.063	2.00
4	177.462	179.1	4.00	0.063	2.00
6	59.159	60.8	6.00	0.063	2.00
7	-0.001	1.6	7.00	0.063	2.00
8	-59.159	-57.5	8.00	0.063	2.00
10	-177.463	-175.8	10.00	0.063	2.00
12	-295.812	-294.2	12.00	0.063	2.00
14	-414.119	-412.5	14.00	0.063	2.00

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

Equipment: pH Electrode Type: Combined Electrode

Manufacturer: HANNA INSTRUMENTS Model: HI1310

Serial No.: 078743 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	189.8	96.7	0.0071	2.00
6.865	6.87	6.2	-	0.0075	2.00
10.008	10.01	-174.0	97.0	0.0087	2.00
6.985	6.99	-2.0	-	0.0083	2.00

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F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2203135-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: H12020-02
Serial No.: C0051107 ID No.: UAE.WAO.005/2557
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 8 June 2022

Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute

Environment Condition:
Ambient Temperature (23.5 ± 1.0) °C
Relative Humidity (53 ± 3) %

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	1523	2118154	PSL-T 085/64	24-Jun-22	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 3415922

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

F-CS-012 Revision: 01 Date: 20-04-65

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Calibration Report

Certificate No.: 2203135-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: H12020-02
Serial No.: C0051107 ID No.: UAE.WAO.005/2557
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 8 June 2022

Page 5 of 5

Calibration point: 15.0, 20.0 and 25.0 °C

Calibration result:
- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.
- Description of probe, model : HI1310 S/N : 78743
Dimension of probe : Diameter 12 mm., Length 120 mm.,
Sheath material : Glass

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.001	-0.1	0.099
20.1	20.002	-0.1	0.099
25.2	25.002	-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 %.

***** End *****

F-CS-012 Revision: 01 Date: 20-04-65

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