

ผลการติดตามตรวจสอบคุณภาพสิ่งแวดล้อม โครงการศุภาลย์ ลอฟท์ สถานีตลาดพลู ระยะดำเนินการ
บริษัท ศุภาลย์ จำกัด (มหาชน)
ระหว่างเดือนกรกฎาคม ถึง ธันวาคม พ.ศ. 2565

รายการใบรับรองสอบเทียบ / ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำ

No.	Instrument/ Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Water									
1	pH Meter	pH Meter	Ecosense	pH100A JC03335	Technology Promotion Association (Thailand-Japan)	22CH541	19 Apr 22	18 Apr 23	-
2	pH Meter	pH Meter	Hanna Instrument	HI2020-02 / C0051107	National Food Institute, Ministry of Industry, Thailand	2203135-001-01	8 Jun 22	7 Jun 23	-
Laboratory Instrument/Equipment.									
1	pH Meter	ค่าความเป็นกรด-ด่าง (pH)	Hanna Instrument	HI2211 / 08165345	National Food Institute, Ministry of Industry, Thailand	2202097-001-01	11 Mar 22	10 Mar 23	-
2	pH Meter		Mettler-Toledo	Seven Easy/ 1231155210	National Food Institute, Ministry of Industry, Thailand	2201793-001-01	1 Mar 22	28 Feb 23	-
3	BOD Incubator	บีโอดี (Biochemical Oxygen Demand: BOD)	Arco	UC4-1320 / (UAE.WAO.006/2553)	Technology Promotion Association (Thailand-Japan)	22TM306	7 Apr 22	6 Apr 23	-
4	BOD Incubator		Arco	UC4-1320 / (UAEWAO0015/2561)	Technology Promotion Association (Thailand-Japan)	22TM90	17 Feb 22	16 Feb 23	-
5	COD Reactor (Heating Block)	ซีโอดี (Chemical Oxygen Demand: COD)	Hanna	HI839800-02 / H0185001	Hanna Instruments (Thailand) Ltd.	HIT-2209-0184	1 Mar 22	28 Feb 23	
6	Analytical Balance (Repeatability 0.01 mg)	ของแข็งที่ละลายได้ทั้งหมด (Total Dissolved Solids: TDS)	Mettler-Toledo	XSR205DU / C009071872	Technology Promotion Association (Thailand-Japan)	22MM210	26 Apr 22	25 Apr 23	-

ผลการติดตามตรวจสอบคุณภาพสิ่งแวดล้อม โครงการศุภาลย์ ลอฟท์ สถานีตลาดพลู ระยะดำเนินการ
บริษัท ศุภาลย์ จำกัด (มหาชน)
ระหว่างเดือนกรกฎาคม ถึง ธันวาคม พ.ศ. 2565

รายการใบรับรองสอบเทียบ / ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำ

Laboratory Instrument/Equipment.									
7	Hot Air Oven	ของแข็งแขวนลอย (Suspended Solids: SS)	Memmert	UF55 / B216.0411	Technology Promotion Association (Thailand-Japan)	22TM304	7 Apr 22	6 Apr 23	-
8	Analytical Balance (Repeatability 0.1 mg)	น้ำมันและไขมัน (Fat, Oil and Grease)	Mettler-Toledo	XPE205 / B748058497	Mettler-Toledo (Thailand) Ltd.	TH2058-028- 0422-ACC-TH	1 Apr 22	31 Mar 23	-
9	Digester Unit	ไนโตรเจนในรูปทีเคเอ็น (Total Kjeldahl Nitrogen: TKN)	FOSS TECATOR	2520auto / 91794469	National Food Institute, Ministry of Industry, Thailand	2202361-001-01	6 Apr 22	5 Apr 23	-
10	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT8100 / 91889052	FOSS South East Asia	6623	25 Jul 22	24 Jul 23	-
11	Incubator (Cooled Incubator)	โคลิฟอร์มแบคทีเรีย (Total Coliform Bacteria) ฟิโคลโคลิฟอร์ม (Fecal coliform)	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	22TM672	5 May 22	4 May 23	-
12	Incubator (Cooled Incubator)		Memmert	IPP 260 / V618.0033	Technology Promotion Association (Thailand-Japan)	22TM503	3 May 22	2 May 23	-
13	Water Bath		Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	22TM333	17 Feb 22	16 Feb 23	-
14	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	22TM334	17 Feb 22	16 Feb 23	-
15	Analytical Balance		Mettler-Toledo	MS603S / B0070110311	Mettler-Toledo (Thailand) Ltd.	TH2058-096- 040722-ACC-TH	7 Apr 22	6 Apr 23	-
16	Auto Clave		ALP	CL-40L / 807298	Technology Promotion Association (Thailand-Japan)	22TM1121	11 Jul 22	10 Jul 23	-

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



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



Cert.No.: 22CH541

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Certificate of Calibration

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC03335
ID No. : UAE.EFM.062/2562(ENV.pH.02/62)
Condition As-Received: Used Item
Received Date : 18 April 2022
Calibration Date : 19 April 2022
Reference : 2204-0341WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lernagtrakul

Approved by :

App

- (/) Malee Butkruea
() Saithip Meangmai
() Warakorn Lernagtrakul

Issue Date : 21 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.

เอกสารไม่ควบคุม

A 0039922



Cert.No.: 22CH541

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	21E2682	25 Aug 2022
2) Ref. Standard Thermometer	4982054	110RC044	21I1201	26 Oct 2022

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

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

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	788995	01 Jan 2024
pH 6.983	CPA chem	766822	04 Sep 2022
pH 10.015	CPA chem	766824	04 Sep 2022

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: JC03335	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

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a 1104906



Cert.No.: 22CH541

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Calibration Results**Function : pH Measurement**

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor <i>k</i>
pH Electrode S/N.:220202SIA605377	4.008	4.01	173	0.0079	2.00
	6.983	6.98	-2	0.011	2.00
	6.983	6.98	-2	0.011	2.00
	10.015	10.01	-178	0.0092	2.00

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

This equipment was connected with Temperature Probe;

- Model : -

- Serial No. : 220202SIA605377

Dimension of probe;

- Length : 110 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor <i>k</i>
25.0	25.002	25.1	0.098	0.13	2.00
30.0	30.003	30.1	0.097	0.13	2.00
35.0	35.002	35.1	0.098	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

-o0o-

เอกสารไม่ควบคุม

a 1104905

Calibration Certificate

Certificate No.: 2203135- 001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 5

Equipment: 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.Ph

Manager, Division of Calibration Laboratory

Date of Issue: 13 June 2022

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.

F-CS-009 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 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-CC-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-21F-0687	24 June 2022
2.2 Digital Thermometer	2709007	Fluke	CC-640599-01	30 October 2022
2.3 Thermo-Hygro Meter	NFI.BTH005/18	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	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0075
3.2 Instruments No.2.2	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292
3.4 Certified Reference Material No. 2.4 to 2.6	traceable to	Primary measurement method- Harned cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No.2.7	traceable to	BIM RefN HI-27 LotN 04.06.2021; BIM RefN HI-28 LotN 28.05.2021; BIM RefN HI-27 LotN 04.06.2021; BIM RefN HI-28 LotN 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.



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

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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: HI11310

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	169.8	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	-	0.0093	2.00



Calibration Report

Certificate No.: 2203135-001-01

Equipment: Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C **Model:** HI2020-02

Serial No.: C0051107 **ID No.:** UAE.WAO.005/2557

Manufacturer: HANNA INSTRUMENTS

Date of Calibration: 8 June 2022

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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 0851/64	24-Jun-22	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

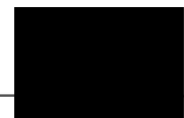
Support Equipment : - Low Temperature Bath (ISOCAL-6), Model: Europa-6 Plus Basic, S/N: 341592/2

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

6. Condition of Calibrated item : Good

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

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:** HI2020-02

Serial No.: C0051107 **ID No.:** UAE.WAO.005/2557

Manufacturer: HANNA INSTRUMENTS

Date of Calibration: 8 June 2022

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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 : HI11310 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

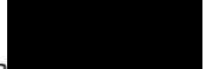
Calibration Certificate

Certificate No.: 2202097-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: HANNA INSTRUMENTS
Model: HI 2211
Serial No.: 08165345
ID No.: UAE.WAT.004/2556
Order No.: 2202097
Operation No.: 2202097-001
Date of Receipt: 11 March 2022
Date of Calibration: 16 March 2022

Calibrated by Mr.Manas Somsak
Specialist

Approved by 
(Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory

Date of Issue: 21 March 2022

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.: 2202097-001-01

Equipment: pH Meter **Resolution:** 0.01 pH ; 0.1/1 mV
Manufacturer: HANNA INSTRUMENTS **Model:** HI 2211
Serial No.: 08165345 **Type:** Bench top
ID No.: UAE.WAT.004/2556

Date of Calibration: 16 March 2022

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Location: Chemical Calibration Laboratory, National Food Institute.

Environment Condition: **Ambient Temperature:** (23.0 ± 1.5) °C **Relative Humidity:** (49.5 ± 5) %

Condition of Equipment: Good Condition

Condition of this Results of Calibration

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

2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-21F-0687	24 June 2022
2.2 Digital Thermometer	2709007	Fluke	CC-640599-01	30 October 2022
2.3 Thermo-Hygro Meter	สทอ.พล. BTH 005/58	PONPE	QR21-2787	15 November 2022

Certified Reference Material	Lot. No.	Manufacturer	Ref N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	780012	CPAchem	PH216.L5	21 November 2023
2.5 pH buffer 6.865 (Primary pH buffer Solution)	780013	CPAchem	PH217.L5	21 November 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	780015	CPAchem	PH220.L5	21 November 2022
2.7 pH buffer 7.00 (Standard pH buffer Solution)	776840	CPAchem	PH107.L5	8 November 2022

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

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

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

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

Calibration Report

Certificate No.: 2202097-001-01

Equipment: pH Meter Resolution: 0.01 pH ; 0.1/1 mV
Manufacturer: HANNA INSTRUMENTS Model: HI 2211
Serial No.: 08165345 Type: Bench top
ID No.: UAE.WAT.004/2556

Date of Calibration: 16 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	414.117	414	0.00	0.58	2.00
2	295.811	295.7	2.00	0.063	2.00
4	177.462	177.4	4.00	0.063	2.00
6	59.159	59.2	6.00	0.063	2.00
7	-0.001	0.1	7.00	0.063	2.00
8	-59.159	-59.1	8.00	0.063	2.00
10	-177.463	-177.3	10.00	0.063	2.00
12	-295.812	-295.6	12.00	0.063	2.00
14	-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: LE420
Serial No.: 1142602 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	180.5	99.3	0.0071	2.00
6.866	6.87	12.5	-	0.0074	2.00
10.015	10.01	-171.5	99.1	0.0090	2.00
6.983	6.98	5.2	-	0.0092	2.00

Calibration Report

Certificate No.: 2202097-001-01

Equipment: Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: HI 2211
Serial No.: 08165345 ID No.: UAE.WAT.004/2556
Manufacturer: HANNA INSTRUMENTS

Date of Calibration: 16 March 2022

Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute.

Environment Condition: Ambient Temperature (23.0 ± 1.0) °C
Relative Humidity (50 ± 4) %

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	24-Jun-22	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

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

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

6. Condition of Calibrated item : Good

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

Calibration Report

Certificate No.: 2202097-001-01

Equipment: Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C Model: HI 2211

Serial No.: 08165345 ID No.: UAE.WAT.004/2556

Manufacturer: HANNA INSTRUMENTS

Date of Calibration: 16 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 S/N : N/A

Dimension of probe : Diameter 3.5 mm., Length 100 mm.,

Sheath material : Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.0	15.001	0.0	0.099
25.0	25.002	0.0	0.099
35.0	35.002	0.0	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 -----

Calibration Certificate

Certificate No.: 2201793-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: METTLER TOLEDO
Model: SevenEasy pH
Serial No.: 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

Approved by

Specialist, Division of Calibration Laboratory

Date of Issue: 1 March 2022

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.

UAE		<input type="radio"/> PASS
		<input type="radio"/> NOT PASS
Remarks	pH ± 0.1 pH Unit	
MPE:	mV ± 5 mV	
	temperature $\pm 0.5^\circ\text{C}$	
(Signature)	(Signature)	
Verify	Approve	

7 Mar 2022 Mar 8, 2022



Cert No.: 2201793-001-G1

pH Meter

Mettler toledo

Model: SevenEasy pH

S/N : 1231155210

ID, NO. : UAE.WAT.010/2553

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2201793-001-01

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

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

2. Reference Standards / Certified Reference Material

<u>Instruments</u>	<u>Serial / ID No.</u>	<u>Manufacturer</u>	<u>Certificate No.</u>	<u>Due Date</u>
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-21F-0687	24 June 2022
2.2 Digital Thermometer	2709007	Fluke	CC-640599-01	30 October 2022
2.3 Thermo-Hygro Meter	NFI.BTH004/18	PONPE	QR22-0195	27 January 2023

<u>Certified Reference Material</u>	<u>Lot. No.</u>	<u>Manufacturer</u>	<u>Ref N</u>	<u>Expire Date</u>
2.4 pH buffer 4.008 (Primary pH buffer Solution)	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-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0075
3.2 Instruments No.2.2	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292
3.4 Certified Reference Material No. 2.4 to 2.6	traceable to	Primary measurement method- Harned cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No. 2.7	traceable to	BIM RefN HI-7 LotN 30.04.2020; BIM RefN HI-9 LotN 28.05.2020; BIM RefN HI-8 LotN 30.04.2020; BIM RefN HI-10 LotN 28.05.2020. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

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

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

Calibration Report

Certificate No.: 2201793-001-01

Equipment:

pH Meter

Resolution: 0.01 pH ; 1 mV

Manufacturer: METTLER TOLEDO

Model: SevenEasy pH

Serial No.: 1231155210

Type: Bench top

ID No.: UAE.WAT.010/2553

Date of Calibration: 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	-	0.0079	2.00
10.012	10.01	-162	96.13	0.0094	2.00
6.985	7.00	9	-	0.0097	2.00

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: 341592/2

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

6. Condition of Calibrated item :

Good

7. Result of Calibration :

☒

Without adjustment

☐

After adjustment

Calibration Report

Certificate No.: 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 S/N : 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

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 -----



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.: 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 :

Approved Signatory

- () Pornthippa 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.

เอกสารไม่ควบคุม

A 0040247

 <input checked="" type="radio"/> PASS <input type="radio"/> NOT PASS	
Remarks	
MPE : $20 \pm 1^\circ\text{C}$	
 Verify	 Approve

Cert No. : 22TM306

BOD Incubator

ARCO

UR-1320

25 Apr 2022 Apr 25, 2022 ID No. : UAE.WAO.006/2553

Chit

25 Apr 2022

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2204-0015OC-3

Cert. No.: 22TM306

Page.: 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	34970A	MY41021843	22LM4	10 Jan 2023

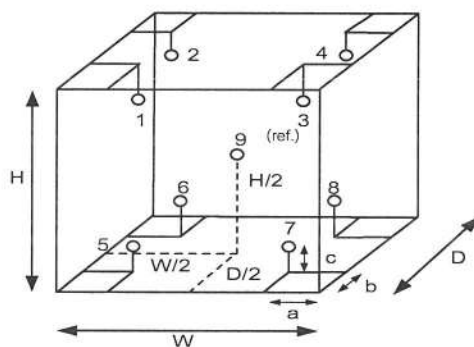
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



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

Probe Installation Details :

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

Dimension of Chamber :

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

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

เอกสารไม่ควบคุม

a 1104312



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2204-0015OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM306

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
20.0	20.0	19.9	0.33	0.68	1.4	0.50	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.176	20.413	19.711	19.637	20.218	20.286	19.639	19.642	19.922

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



Cert. No.: 22TM90

Page.: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator

Manufacturer : Arco

Model : UC4-1320

Serial No. : 13URC4S013201

ID No. : UAE.WAO.015/2561

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

Location : Lab Floor 2

Received Order : 17 February 2022

Calibration Date : 17 February 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Kunchit Promprat

Approved by :

Approved Signatory

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

Issue Date : 22 February 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.

เอกสารไม่ควบคุม

UAE
COMPULSORY ISO 9001

☒ PASS
☐ NOT PASS

Remarks

MPE: $20 \pm 1^\circ\text{C}$

WSSM (2/00)

Reate Approve

Cert. NO. : 22TM90

BOD Incubator

Arco

Model : UC4-1320

S/N : 13URC45013201

ID No. : UAE.WAO.015/2561

3 Mar 2022 Mar 7, 2022

C. C. f

2 Mar '22

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2202-0446OC-1

Cert. No.: 22TM90
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	MY44035217	21LM30	23 Dec 2022

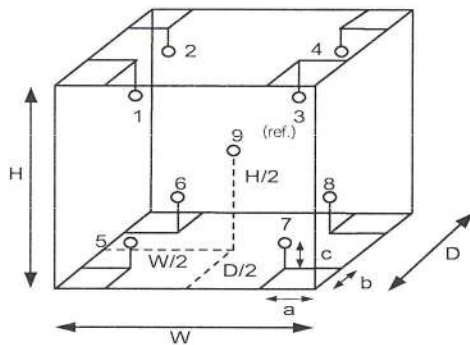
2. This certificate is valid only to the item calibrated on date and place of calibration.

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



Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	28
REL.Humid. (%)	68	75
AC Supply (Volt)	226	226

Probe Installation Details :

Dimension of Chamber :

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

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	22-10RTD-10
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2202-0446OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM90

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
20.0	19.5	19.4	0.30	0.58	1.0	0.55	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.154	20.013	20.356	19.939	19.834	19.761	19.817	19.824	19.922

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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เอกสารไม่ควม

CERTIFICATE OF CALIBRATION

Equipment : COD Test Tube Heater

Meter Model : HI839800-02 **Serial No. :** H018500I

Manufacturer : Hanna Instruments

Made in : Romania

Condition As-Received : Used Product

Reference : RE220234

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

Received date : 21 February 2022

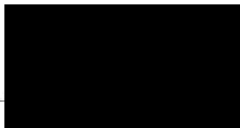

Calibrate date : 1 March 2022

Issue date : 2 March 2022

Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)% RH

Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibrated by :
Mr. Pichit Petthong
Calibration Engineer**Approved by :**
Mr. Anan Suwanaisakul
Authorized Signatory

This certificate was certified only for the instrument we calibrated.

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

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

เอกสารไม่ควบคุม

 <input checked="" type="radio"/> PASS <input type="radio"/> NOT PASS	
Remarks	
MPE: $150 \pm 2^\circ\text{C}$	
 Verify	 Approve

Mar 4, 2022 Mar 8, 2022

Chun A

Mar 07, 2022

cerNo. : MIT-2209-0184

Heating block

Model : HI 839800-02

S/N : H018500I

ID.NO. : UAE.WAS 004/2551

เอกสารไม่ควบคุม

Condition of this result of calibration
Reference Standard Instruments :

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

Reference / Procedure :

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

This temperature scale used was based on ITS-90

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

SITE CALIBRATION

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

เอกสารไม่ควบคุม

Result of Calibration :

Calibration Point	Unit Under Calibration Setting	Unit Under Calibration Reading	Temperature Stability	Uncertainty of Measurement
150.0 (°C)	- (°C)	150.6 (°C)	1.3 (°C)	± 0.39 (°C)

Calibration Point (°C)	Average Standard Reading (°C)				
	Position				
150.0	1	2	3	4	5
	150.2	150.4	150.4	150.3	150.2
	6	7	8	9	10
	150.4	150.9	151.1	151.1	150.6
	11	12	13	14	15
	150.4	151.0	151.5	151.3	150.5
	16	17	18	19	20
	150.3	150.8	151.2	151.2	150.5
	21	22	23	24	25
	150.2	150.3	150.5	150.4	150.3

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

** End of certificate **

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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.: 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

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

Issue Date : 29 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

เอกสารไม่ควบคุม

 <input checked="" type="radio"/> PASS <input type="radio"/> NOT PASS
Remarks
MPE \pm 0.2%
<div>  Verify </div> <div>  Approve </div>

5 May 2022 May 6, 2022
 Eli +
 5 may '22

Cert. No. : 22MM210

Electronic Balance

Mettler Toledo

Model : XSR205

S/N : C009071872

ID. No. : UAE.WAO.012/2563

เอกสารไม่ควบคุม



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

Cert.No.: 22MM210

Page: 2 of 3

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:-

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
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 :

<u>Applied Weight</u>	<u>Balance Reading</u>	<u>Correction</u>	<u>Measurement Uncertainty</u>	<u>Coverage Factor</u>
(g)	(g)	(g)	(± mg)	(k)
80	80.00004	-0.00004	0.15	2.00
200	199.9999	+0.0001	0.35	2.00

After Adjustment :

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

<u>Applied Weight</u>	<u>Standard Deviation of Reading (g)</u>
(g)	
80	0.000008
200	0.00005

เอกสารไม่คว



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

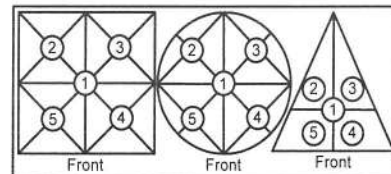
Cert.No.: 22MM210

Page: 3 of 3

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



Maximum difference between
 off-center and central loading
 (g)
 0.0002

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
-0.0002	-0.0001	0.0000	-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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เอกสารไม่คว



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.: 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 :

() Pornthippa 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.

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 <input checked="" type="checkbox"/> PASS <input type="checkbox"/> NOT PASS	
Remarks	
104 ± 1°C	
MPE: 120 ± 5°C	
180 ± 2°C	
(primus)	(2nd)
Verify	Approve

Cert No. : 22TM304

Hot Air Oven

Mettler

25 Apr 2022 Apr 25, 2022 Model : UF55

S/N : B212.0411

Client
25 Apr. 2022

ID No. : VAE.WAO.005/2556

เอกสารไม่ควบคุม



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2204-0015OC-1
Procedure Used :-

Cert. No.: 22TM304
Page.: 2 of 3

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	34970A	MY41021843	22LM4	10 Jan 2023

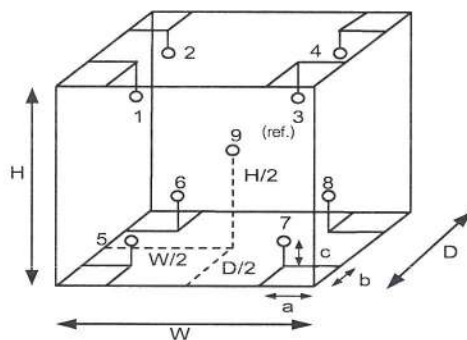
2. This certificate is valid only to the item calibrated on date and place of calibration.

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



Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	28
REL.Humid. (%)	56	55
AC Supply (Volt)	221	224

Ref. Std. ID No.: @ Calibration Point (°C)		
Position :	(120 ,180)	(104)
1	21-04TC-01	18-04RTD-01
2	21-04TC-02	18-04RTD-02
3	21-04TC-03	18-04RTD-03
4	21-04TC-04	18-04RTD-04
5	21-04TC-05	18-04RTD-05
6	21-04TC-06	18-04RTD-06
7	21-04TC-07	18-04RTD-07
8	21-04TC-08	18-04RTD-08
9 (ref.)	21-04TC-09	18-04RTD-09

Probe Installation Details :		Dimension of Chamber :	
a =	5.0 cm	D =	0.50 m
b =	5.0 cm	W =	0.80 m
c =	5.0 cm	H =	0.75 m
		Capacity =	0.30 m ³

เอกสารไม่ควม



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2204-0015OC-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 <i>k</i>
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

Calibration Point (°C)	Measured Temperature (°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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เอกสารไม่ควบคุม

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



Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak
City: Phra Khanong Contact: Suwit Chotnok
Zip / Postal: 10260
State / Province: Bangkok
Order Number: 
* 0 3 3 2 4 0 1 4 9 1 *

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: XPE205 Asset Number: UAE.CAL.004/2561
Serial No.: B748058497 Terminal Model: PEAT
Building: N/A Terminal Serial No.: B748058497
Floor: 2 Terminal Asset No.: N/A
Room: Balance Room 2 (206)

Range	Max. Capacity	Readability (d)
1	220 g	0.00001 g

Procedure

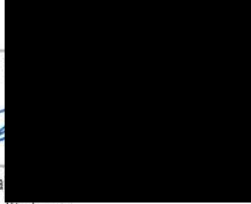

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.

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

	Temperature		Humidity	
As Found	Start: 23.6 °C	End: 23.9 °C	Start: 43.6 %	End: 50.1 %
As Left	Start: 23.7 °C	End: 23.3 °C	Start: 53.7 %	End: 49.4 %

As Found Calibration Date: 31-Mar-2022 Calibrator: 
As Left Calibration Date: 31-Mar-2022
Issue Date: 01-Apr-2022
Approved Signatory: 
☒ Kassa
☐ Santi Jitniyom
☐ Surachet Sukkate

Measurement Results

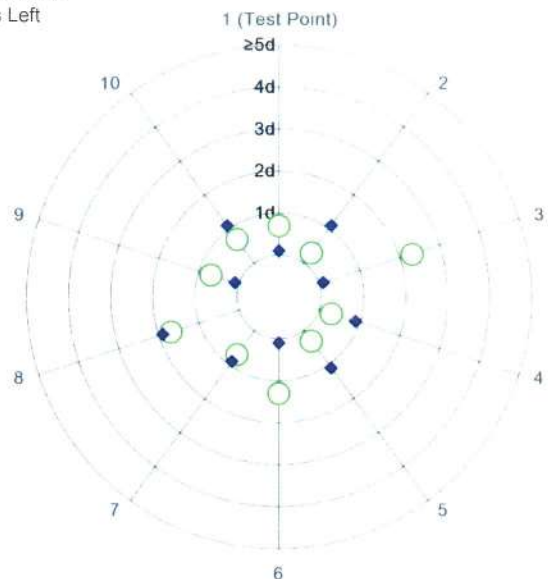
Repeatability

Test Load: 100 g

	As Found	As Left
1	99.99988 g	100.00002 g
2	99.99987 g	100.00001 g
3	99.99985 g	100.00002 g
4	99.99987 g	100.00003 g
5	99.99987 g	100.00001 g
6	99.99986 g	100.00002 g
7	99.99988 g	100.00003 g
8	99.99989 g	100.00004 g
9	99.99988 g	100.00002 g
10	99.99988 g	100.00001 g

Standard Deviation	0.000012 g	0.000010 g
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○ As Found
◆ As Left



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

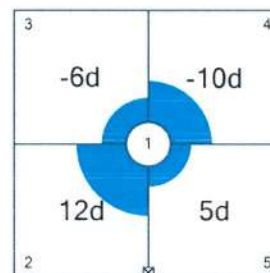
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

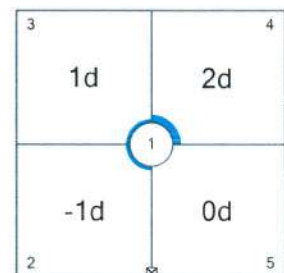
Test Load: 100 g

Position	As Found	As Left
1	99.99986 g	100.00003 g
2	99.99998 g	100.00002 g
3	99.99980 g	100.00004 g
4	99.99976 g	100.00005 g
5	99.99991 g	100.00003 g

Maximum Deviation	0.00012 g	0.00002 g
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As Found



As Left

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

Error of Indication

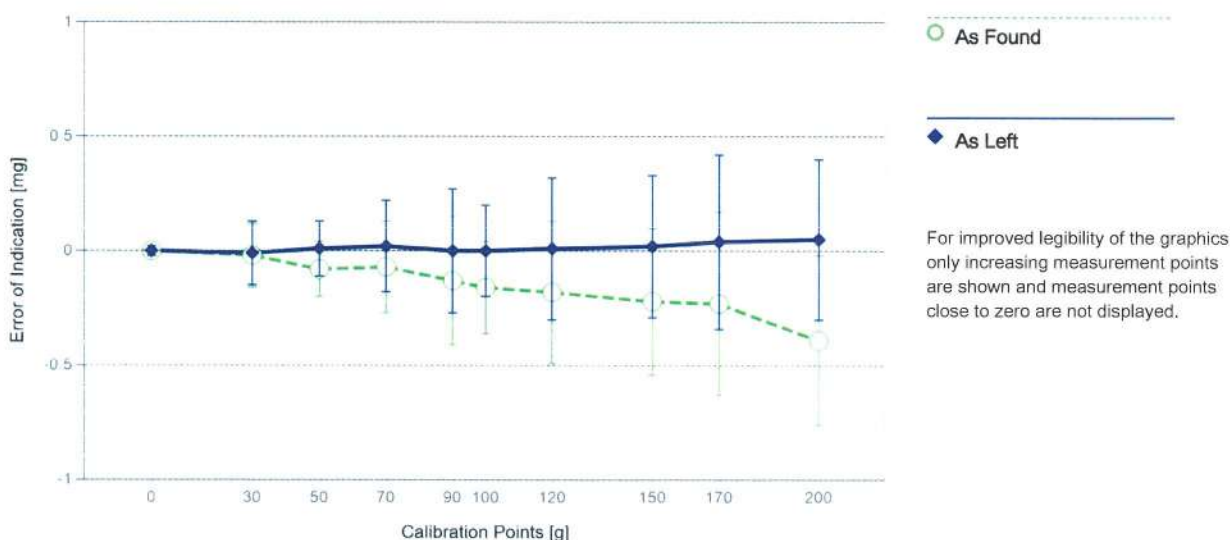
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.024 mg	2
2	10.00001 g	9.99999 g	-0.00002 g	0.063 mg	2
3	30.00005 g	30.00003 g	-0.00002 g	0.14 mg	2
4	50.00001 g	49.99993 g	-0.00008 g	0.12 mg	2
5 *	70.00005 g	69.99998 g	-0.00007 g	0.20 mg	2
6	90.00009 g	89.99996 g	-0.00013 g	0.28 mg	2
7	100.00003 g	99.99987 g	-0.00016 g	0.20 mg	2
8 *	120.00007 g	119.99989 g	-0.00018 g	0.31 mg	2
9	150.00005 g	149.99983 g	-0.00022 g	0.32 mg	2
10	170.00008 g	169.99985 g	-0.00023 g	0.40 mg	2
11	200.00010 g	199.99971 g	-0.00039 g	0.37 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.021 mg	2
2	10.00001 g	10.00000 g	-0.00001 g	0.062 mg	2
3	30.00005 g	30.00004 g	-0.00001 g	0.14 mg	2
4 *	50.00001 g	50.00002 g	0.00001 g	0.12 mg	2
5 *	70.00005 g	70.00007 g	0.00002 g	0.20 mg	2
6	90.00009 g	90.00009 g	0.00000 g	0.27 mg	2
7 *	100.00003 g	100.00003 g	0.00000 g	0.20 mg	2
8 *	120.00007 g	120.00008 g	0.00001 g	0.31 mg	2
9 *	150.00005 g	150.00007 g	0.00002 g	0.31 mg	2
10	170.00008 g	170.00012 g	0.00004 g	0.38 mg	2
11 *	200.00010 g	200.00015 g	0.00005 g	0.35 mg	2

*The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS80	Date of Issue:	23-Feb-2022
Certificate Number:	C208581631	Calibration Due Date:	14-Aug-2023

Thermo Hygrometer

Equipment No.:	IN161	Date of Issue:	14-Jun-2021
Certificate Number:	21H1220	Calibration Due Date:	01-Jun-2022

Remarks

FACT adjustment functionality activated

Value of the built-in weight adjusted

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

This certificate was issued to replace to the Certificate No.TH2058-082-033122-ACC-TH

Asset Number UAE.LAB.004/2561 was edited to Asset Number UAE.CAL.004/2561

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

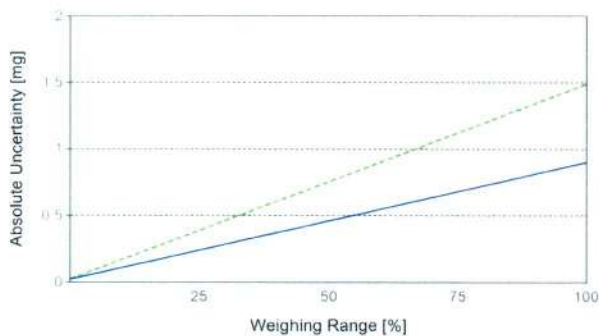
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.00001 g	220 g	$U_1 = 0.025 \text{ mg} + 0.00666 \text{ mg/g} \cdot R$	$U_1 = 0.021 \text{ mg} + 0.00400 \text{ mg/g} \cdot R$

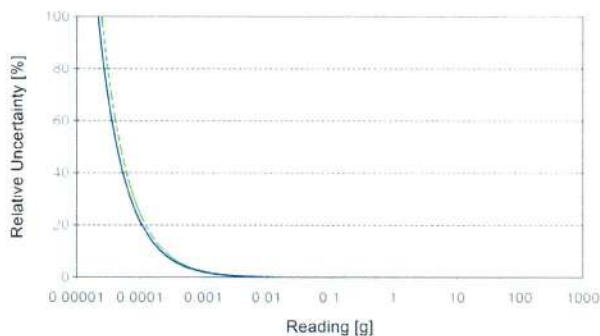
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.00220 g	0.025 mg	1.1%	0.021 mg	0.95%
0.02200 g	0.025 mg	0.11%	0.021 mg	0.096%
0.22000 g	0.026 mg	0.012%	0.022 mg	0.0099%
2.20000 g	0.040 mg	0.0018%	0.030 mg	0.0014%
220.00000 g	1.5 mg	0.00068%	0.90 mg	0.00041%



As Found



As Left

GWP® Certificate



As
Found



As
Left



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



As Found



As Left

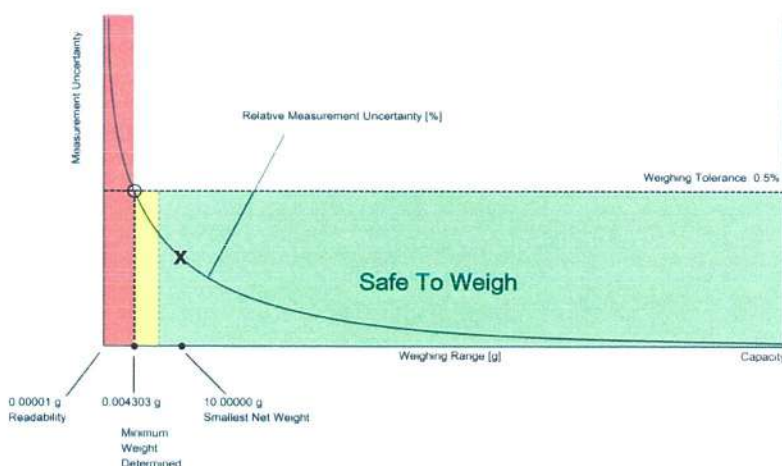
Process Requirements

Weighing Tolerance: 0.5%

Smallest Net Weight: 10.00000 g

Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.024750 g	0.049835 g	0.075261 g	0.127164 g	0.263408 g
0.2%	0.012334 g	0.024750 g	0.037251 g	0.062505 g	0.127164 g
0.5%	0.004924 g	0.009860 g	0.014810 g	0.024750 g	0.049835 g
1%	0.002460 g	0.004924 g	0.007390 g	0.012334 g	0.024750 g
2%	0.001230 g	0.002460 g	0.003692 g	0.006157 g	0.012334 g
5%	0.000492 g	0.000984 g	0.001476 g	0.002460 g	0.004924 g



Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.021586 g	0.043346 g	0.065282 g	0.109691 g	0.223954 g
0.2%	0.010771 g	0.021586 g	0.032444 g	0.054291 g	0.109691 g
0.5%	0.004303 g	0.008614 g	0.012931 g	0.021586 g	0.043346 g
1%	0.002151 g	0.004303 g	0.006458 g	0.010771 g	0.021586 g
2%	0.001075 g	0.002151 g	0.003227 g	0.005380 g	0.010771 g
5%	0.000430 g	0.000860 g	0.001290 g	0.002151 g	0.004303 g



Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with $k = 2$ and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	0.005000 g	0.000012 g	✓	0.000010 g	✓
0.2%	0.010000 g		✓		✓
0.5%	0.025000 g		✓		✓
1%	0.050000 g		✓		✓
2%	0.100000 g		✓		✓
5%	0.250000 g		✓		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.05000 g	0.00012 g	✓	0.00002 g	✓
0.2%	0.10000 g		✓		✓
0.5%	0.25000 g		✓		✓
1%	0.50000 g		✓		✓
2%	1.00000 g		✓		✓
5%	2.50000 g		✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

Reference Value	Error	Control limits for various weighing tolerances					
		0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
30.00005 g	-0.00002 g	0.01500 g	0.03000 g	0.07500 g	0.15000 g	0.30000 g	0.75000 g
50.00001 g	-0.00008 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
70.00005 g	-0.00007 g	0.03500 g	0.07000 g	0.17500 g	0.35000 g	0.70000 g	1.75000 g
90.00009 g	-0.00013 g	0.04500 g	0.09000 g	0.22500 g	0.45000 g	0.90000 g	2.25000 g
100.00003 g	-0.00016 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g
120.00007 g	-0.00018 g	0.06000 g	0.12000 g	0.30000 g	0.60000 g	1.20000 g	3.00000 g
150.00005 g	-0.00022 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g
170.00008 g	-0.00023 g	0.08500 g	0.17000 g	0.42500 g	0.85000 g	1.70000 g	4.25000 g
200.00010 g	-0.00039 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances					
		0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
30.00005 g	-0.00001 g	0.01500 g	0.03000 g	0.07500 g	0.15000 g	0.30000 g	0.75000 g
50.00001 g	0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
70.00005 g	0.00002 g	0.03500 g	0.07000 g	0.17500 g	0.35000 g	0.70000 g	1.75000 g
90.00009 g	0.00000 g	0.04500 g	0.09000 g	0.22500 g	0.45000 g	0.90000 g	2.25000 g
100.00003 g	0.00000 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g
120.00007 g	0.00001 g	0.06000 g	0.12000 g	0.30000 g	0.60000 g	1.20000 g	3.00000 g
150.00005 g	0.00002 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g
170.00008 g	0.00004 g	0.08500 g	0.17000 g	0.42500 g	0.85000 g	1.70000 g	4.25000 g
200.00010 g	0.00005 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

Verification Certificate

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

Page 1 of 4

Equipment: 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

(M)

Manager, Division of Calibration Laboratory

Date of Issue: 11 April 2022

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.

 <input checked="" type="checkbox"/> PASS <input type="checkbox"/> NOT PASS	
Remarks	
MPE : $380 \pm 5^{\circ}\text{C}$	
 Verify	 Approve

Certificate No. : 2202361-001-01

Heating Block Digestion

Model : 2520

S/N : 91794469

ID No : UAE-WAS.011/2560

20 Apr 2022 Apr 21, 2022

Chut

20 Apr '22

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:

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

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

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

UUC* Description

Time of Record - Hour 30 Minute At 380 °C

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

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 3 of 4

Calibration point: 380 °C

Calibration result:

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	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

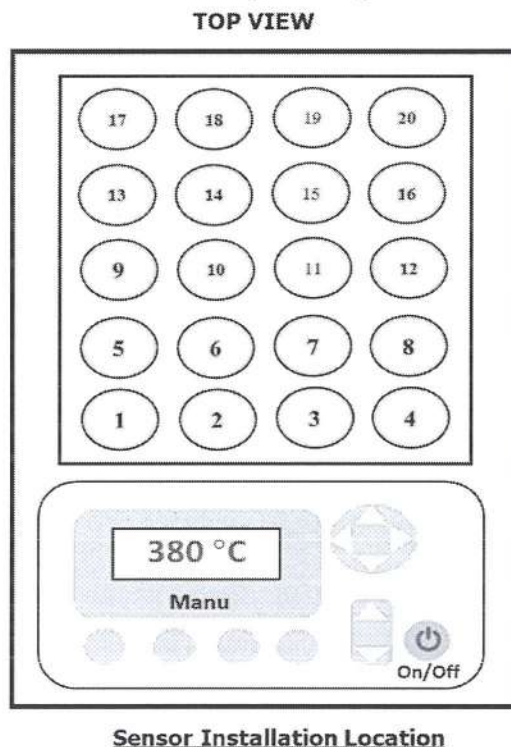
Date of Calibration: 4-6 April 2022

Page 4 of 4

Calibration point: 380 °C

Calibration result: Continued

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



Note:

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

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

----- End -----

FOSS

Customer Service Report

FOSS South East Asia

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

Report No:

6623

Date: July 26, 2022

Customer: United Analyst and Engineering

Address:

กรุงเทพฯ

Instrument: KT8100

Serial: 31889052

Hours

Travel To Customer

Labour

Travel From Customer

Start

9.00

9.00-12.00

3 + 3

16.30

Finish

9.30

30 mins.

13.00-16.00

6 hrs.

17.30

1 hrs.

Job Type

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

PO/Quote Number:

6623

PMA Type

Handheld

Contract No.

Handheld

Details of Work / Test

Condition / Status

- Unpack ภาชนะบรรจุเครื่องมือ

OK

- ตรวจสอบ Accessory kit

OK

- ตรวจสอบปริมาณน้ำยา Alkali, น้ำยาเช็ดทำความสะอาด

OK

- ตรวจสอบเครื่องมือ 1A, 0A, PA

OK

Instrument Ready for Use

OK

Not OK

Handheld

Part No:

Batch

Description

Qty

I confirm this report is accurate and complete

Signed FOSS

Name

Would you be willing to participate in a brief survey in order to tell us how we performed?

Yes

เอกสารไม่ควบคุม

FOSS

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

Report No:

6534

Date:

25/7/2022

Customer:

Trained Analyst and Engineering

Address:

Instrument:

KT 4100

Serial:

91849052

Hours

Travel To Customer

Start

Finish

Labour

3. 10 43

1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1

6 hr

Travel From Customer

4.36

22

1110

Job Type							
Application		Special		Standard			
Normal	1	Courtesy Visit	1	Installation	1	Training	1
Distributor	2	PMA Onboarding	1	Quote	1	In House	1
Internal	3	Warranty	1	Repair	1	PM	1
Digital Service	4	Sales Support	2	Remote	1	Other	1

PO/Quote Number:[illegible]

PMA Type

[illegible]

Contract No.

2000

Details of Work / Test		Condition / Status
		Done
ALIAS TOOL		
- Software		
- Program Editor		
- Mr Setting		
- Manual for		
- User maintenance		
- Run Blank		
- Run Recovery		
Instrument Ready for Use	(OK)	Not OK

[illegible]

I confirm this report is accurate and complete

Signed FOSS

Name

Figure 9

Would you be willing to participate in a brief survey in order to tell us how we performed?

2000

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	918 89052

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

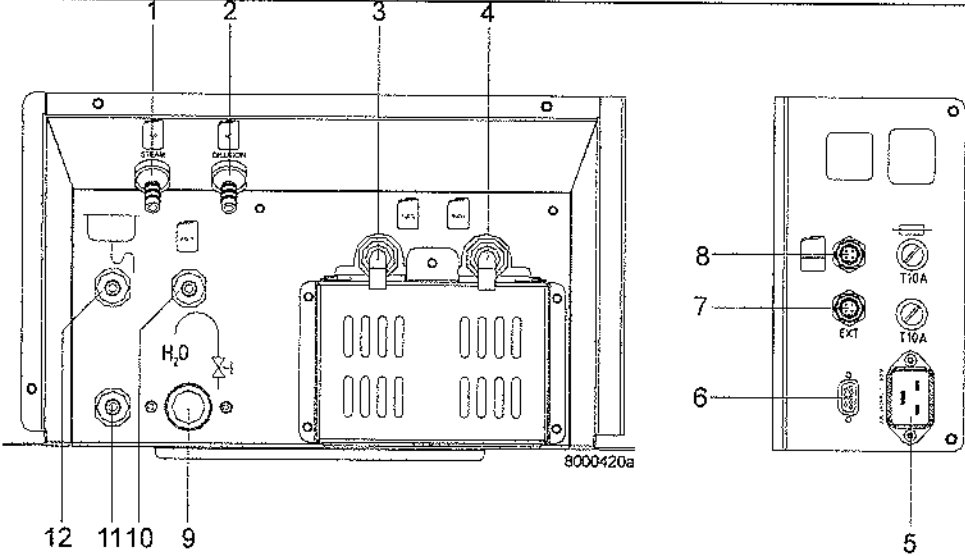
5.1 The equipment must be installed in a suitable location with power, water and draining available

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

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
	After start-up, Program 1 is loaded and the Analyse menu is displayed.	Y
Turn on the cold water tap	No visible reaction	Y
Press the “Manual” view	The Manual menu is opened	Y
Open the door with the handle, place the test tube and receiver flask in position. Close the door.		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 Onnom

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	91889052

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 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	<u>83</u> ml <u>83</u> ml <u>82</u> ml Mean <u>82.67</u> ml	76- 84 ml	Y
Alkali volume	<u>52</u> ml <u>52</u> ml <u>53</u> ml Mean <u>52.33</u> ml	47- 54 ml	Y

4.2 Verify the distillation procedure, accuracy and precision

The distillation principle is to convert ammonium (NH_4^+) into ammonia (NH_3) by using an alkali (NaOH) and thereafter steam distil 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 ($(\text{NH}_4)_2\text{SO}_4$, 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, distil 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. <u>0.08</u> ml 2. <u>0.14</u> ml	0.05-0.20 ml	Y
Recovery	1. <u>100.20</u> % 2. <u>100.30</u> % 3. <u>100.63</u> % 4. <u>99.01</u> % 5. <u>99.97</u> % 6. <u>100.09</u> %		
Accuracy	Mean Value: <u>100.03</u>	99-101%	Y
Precision	SD: <u>0.557</u>	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%

$$\% \text{ Nitrogen} = \frac{(ml_{\text{sample}} - ml_{\text{blank}}) \times N \times 14,007 \times 100}{mg_{\text{sample}}} \quad \begin{matrix} \nearrow 0.1095 \\ 21.72 \end{matrix}$$

N = Normality of titrant to 4 places of decimal.

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

mg sample

- ① ~~0.1592~~ 23.56
- 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 (Na_2CO_3). 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 0.1g bromocresol green in 100 ml methanol.

- **Procedure**

Weigh approx. 0.4 g of the standard substance, using an analytical balance, note the weight (W_1). Transfer the sodium carbonate to a receiver flask and add 40 ml of H_2O (distilled or deionized). Add 8 drops from each of the indicator solutions. Titrate to pink. Note the amount in ml used (A_1). 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

(A_2). 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 (A_3)

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

$$\text{Molarity (M)} = \frac{18,870 \times W_1}{(A_1 + A_2 + A_3)}$$

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.

Kjeltec™ 8100 Distillation Unit Tecator™ 2508/2520 Digester

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 Digester, chapter 5. Maintenance.

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

4.2 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 or 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 (Kjeltabs, 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 weighed 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 Kjeltex™ 8100

See instructions in User Manual - Kjeltex 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.

[illegible]

Applicable for FOSS sales and service companies.

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																				

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6.2.4 Additional Maintenance

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

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



Cert. No.: 22TM672

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V616.0066

ID No. : UAE.MIC.032/2559

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

Location : Microbiology Laboratory (302)

Received Order : 3 May 2022

Calibration Date : 5 May 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

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

Issue Date : 11 May 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

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-3

Cert. No.: 22TM672

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

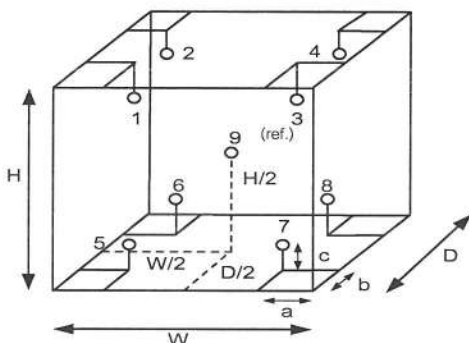
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	23
REL.Humid. (%)	62	57
AC Supply (Volt)	221	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

Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
W = 0.60 m
H = 0.80 m
Capacity = 0.24 m³

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM672

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
25.0	25.0	25.0	0.021	0.18	0.33	0.30	2
36.0	36.0	36.0	0.077	0.96	1.8	0.33	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
25.0	25.221	25.146	25.127	25.113	24.968	24.986	24.933	25.017	25.047
36.0	35.637	35.238	36.130	36.515	36.928	36.845	36.630	36.761	36.113

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



Cert. No.: 22TM503

Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V618.0033

ID No. : UAE.MIC.021/2561

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 : Krisda Malee

Approved by :

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

Issue Date :

10 May 2022

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-4

Cert. No.: 22TM503

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	MY49023932	21LM8	06 Jul 2022

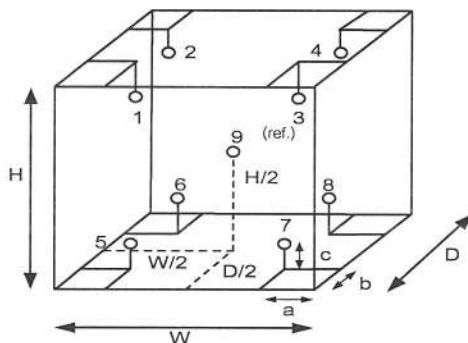
2. This certificate is valid only to the item calibrated on date and place of calibration.

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



Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	22
REL.Humid. (%)	53	54
AC Supply (Volt)	221	220

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

Probe Installation Details :

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

Dimension of Chamber :

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

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2205-0003OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM503

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
22.0	22.0	22.0	0.051	0.095	0.19	0.30	2
44.0	44.0	44.0	0.10	0.83	1.2	0.32	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
22.0	22.238	22.200	22.139	22.207	22.184	22.178	22.136	22.169	22.161
44.0	44.604	44.670	44.240	44.315	43.974	44.446	43.584	44.209	44.306

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



Cert. No.: 22TM333

Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 14

Serial No. : L416.0606

ID No. : UAE.MIC.002/2560

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

Location : Microbiology Laboratory

Received Order : 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

(/) Pornthippa Tameyakul
(/) Malee Butkruea

Issue Date : 22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-3
Procedure Used :-

Cert. No.: 22TM333
Page.: 2 of 3

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

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

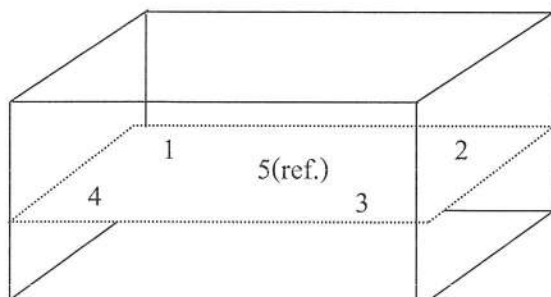
2. This certificate is valid only to the item calibrated on date and place of calibration.

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
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	21	65	229
Finished of Calibration	22	58	230



Front

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



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM333

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	44.498	44.481	44.482	44.518	44.534

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
44.5	0.13	0.057	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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TEL. 0-2717-3000-27 FAX. 0-2719-9484



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 :

Malee

Approved Signatory

(/) Pornthippa Tameyakul

(/) Malee Butkruea

Issue Date :

22 February 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.

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:-

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

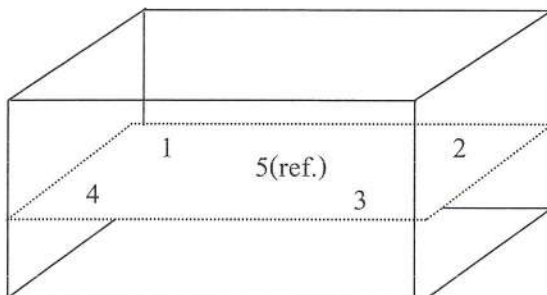
2. This certificate is valid only to the item calibrated on date and place of calibration.

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
	(°C)	(%R.H.)	(Volt)
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 : 2202-0444OC-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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เอกสารไม่ครบชุด

a 1096054

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



Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak
City: Phra Khanong Contact: Suwit Chotnok
Zip / Postal: 10260
State / Province: Bangkok
Order Number: 
* 0 3 3 2 4 2 3 9 0 6 *

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: AB204-S Asset Number: UAE.AIR.019/2550
Serial No.: 1128312528 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: 2 Terminal Asset No.: N/A
Room: Balance Room 2 (206)

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

Procedure

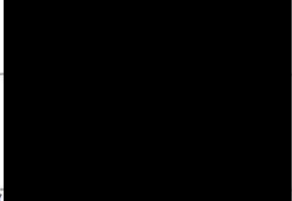
Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

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

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

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

	Temperature		Humidity	
As Found	Start: 22.5 °C	End: 21.4 °C	Start: 56.1 %	End: 63.2 %

As Found Calibration Date: 07-Apr-2022 Calibrator: 
As Left Calibration Date: N/A
Issue Date: 08-Apr-2022
Approved Signatory:
☒ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate

UAE COMPLIANCE CODE	<input checked="" type="radio"/> PASS <input type="radio"/> NOT PASS
Remarks	
MPE: $\pm 0.2\%$	
(Signature) Verify	(Signature) Approve

29 Apr 2022 Apr 27, 2022

EWJ

22 Apr 02

Calibration Certificate ID:

TH2058-097-040722-ACC-TH

Balance

Mettler Toledo

Model : AB204-S

S/N : 1128312528

ID NO. : UAE.AIR.019/2550

เอกสารไม่ควบคุม

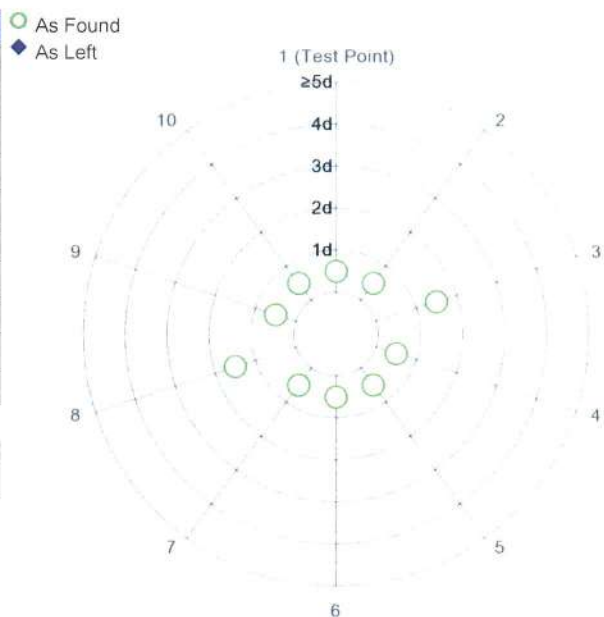
Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9999 g	N/A
2	100.0000 g	N/A
3	99.9998 g	N/A
4	100.0000 g	N/A
5	99.9999 g	N/A
6	100.0000 g	N/A
7	99.9999 g	N/A
8	100.0001 g	N/A
9	99.9999 g	N/A
10	100.0000 g	N/A

Standard Deviation	0.00008 g	N/A
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The "d" in the graph represents the readability of the range/interval in which the test was performed.

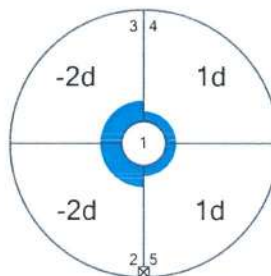
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	99.9998 g	N/A
3	99.9998 g	N/A
4	100.0001 g	N/A
5	100.0001 g	N/A

Maximum Deviation	0.0002 g	N/A
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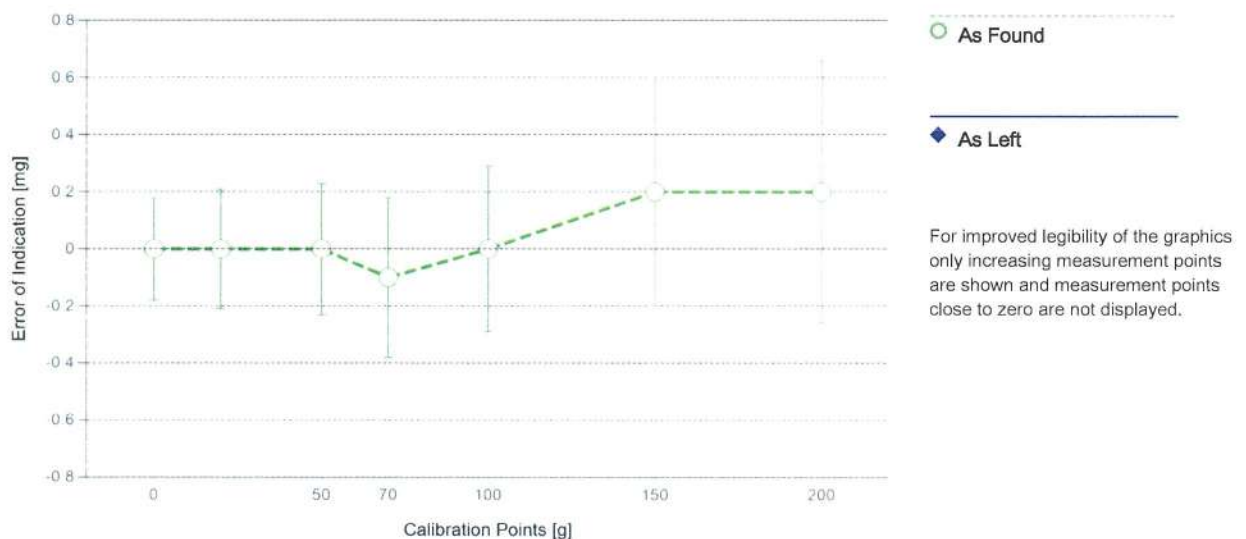
As Found

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

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.18 mg	2
2	0.1000 g	0.1000 g	0.0000 g	0.19 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	0.19 mg	2
4	5.0000 g	5.0000 g	0.0000 g	0.19 mg	2
5	10.0000 g	9.9999 g	-0.0001 g	0.20 mg	2
6	20.0000 g	20.0000 g	0.0000 g	0.21 mg	2
7	50.0000 g	50.0000 g	0.0000 g	0.23 mg	2
8	70.0001 g	70.0000 g	-0.0001 g	0.28 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.29 mg	2
10	150.0000 g	150.0002 g	0.0002 g	0.40 mg	2
11	200.0001 g	200.0003 g	0.0002 g	0.46 mg	2



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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS80	Date of Issue:	23-Feb-2022
Certificate Number:	C208581631	Calibration Due Date:	14-Aug-2023

Thermo Hygrometer

Equipment No.:	IN161	Date of Issue:	14-Jun-2021
Certificate Number:	21H1220	Calibration Due Date:	01-Jun-2022

Remarks

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

Test weight by Filter pan : 1 g = 0.9999 g, 3 g = 3.0000 g, 5 g = 5.0000 g

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

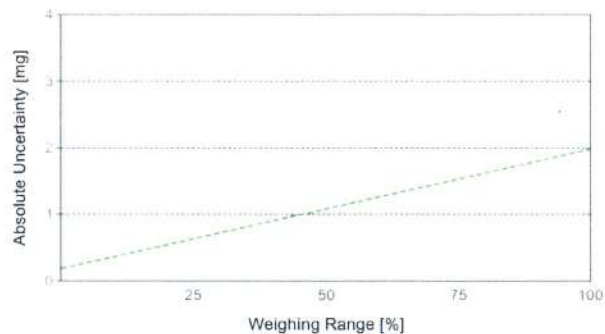
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.19 \text{ mg} + 0.00817 \text{ mg/g} \cdot R$	N/A

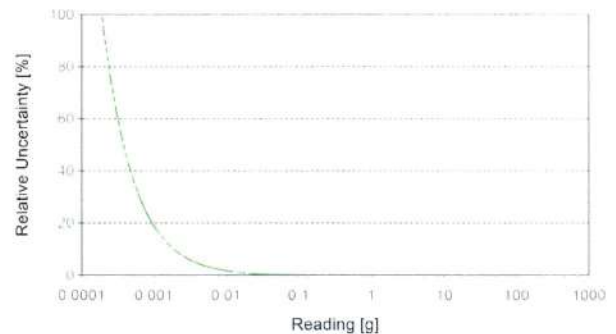
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.19 mg	0.86%	N/A	N/A
0.2200 g	0.19 mg	0.087%	N/A	N/A
2.2000 g	0.21 mg	0.0095%	N/A	N/A
22.0000 g	0.37 mg	0.0017%	N/A	N/A
220.0000 g	2.0 mg	0.00090%	N/A	N/A



As Found



As Left



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.: 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
Location : 301 Room
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

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

Issue Date : 18 July 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 : Autoclave
Condition As-Received : Used Item
Reference : 2207-0245OC-7

Cert. No.: 22TM1121

Page.: 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	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**

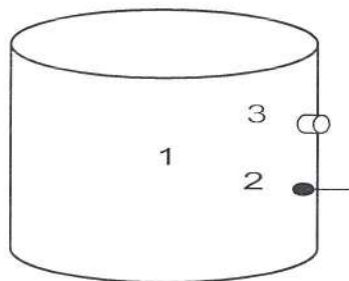
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)

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



	<u>Environmental</u>		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	29	49	220
Finished of Calibration	32	48	220

<u>Position</u>	<u>Description</u>	<u>Ref. Std. ID No.:</u>
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