

ภาคผนวก จ
เอกสารเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์



List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Equipment for Air Quality Analysis									
1	Analytical Balance	PM10, PM2.5, TSP	Mettler-Toledo	ND20015470	National Food Institute, Ministry of Industry, Thailand	200203050106	19 Apr 24	18 Apr 25	
2	UV-Vis Spectrophotometer	Water Quality (pH, DO, Turbidity, TSS)	HiPoint Technologies	C450154235	DOE Services Co., Ltd.	2023030101	9 May 24	8 May 25	
Equipment for Water Quality Analysis									
3	Analytical Balance	DO and Dissolve	Mettler-Toledo	XS2004 / C11705043	Technology Promotion Association (Thailand-Japan)	2002030101	11 May 24	10 May 25	
4	Analytical Balance	Suspended Solids	Mettler-Toledo	XS2000010 / C10000010	National Food Institute, Ministry of Industry, Thailand	200203050106	2 Apr 24	1 Apr 25	
5	Hot Air Oven	Water Dissolved Solids	Hanmett	GT 55 / C10000010	National Food Institute, Ministry of Industry, Thailand	200203050106	11 Oct 23	10 Oct 24	
6	BOD Incubator	BOD	Aeco	ET24-1666 / 1004-1300 / 2020000010335	Technology Promotion Association (Thailand-Japan)	2020030101	18 Feb 24	9 Feb 25	
7	Digestion Unit	Total Kjeldahl Nitrogen	Nela	90420 / 213017	National Food Institute, Ministry of Industry, Thailand	200203050106	28 May 24	23 Sep 25	
8	Dissolution Unit	POSS	FOSS	K10180 / 9180052	FOSS South East Asia	8111	29 May 23	28 May 24	
9	Incubator	Edison Bacteria	Banker	6800 / 2020000010335	Technology Promotion Association (Thailand-Japan)	2020030101	1 Apr 24	31 Mar 25	
10	Incubator	Pest Culture Bacteria	Hanmett	RP 200 / V0405066	Technology Promotion Association (Thailand-Japan)	2020030101	2 Apr 24	1 Apr 25	

วันที่ข้อมูลนี้ได้รับการอนุมัติให้ใช้ได้มีผลจนถึงวันที่ 31 มีนาคม 2575
ข้อมูลนี้ได้รับการตรวจสอบโดย ISO 9001:2015

List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
11	Water Bath	Edison Bacteria	Hanmett	W6131 / L1040005	Technology Promotion Association (Thailand-Japan)	2002030101	10 Feb 24	9 Feb 25	
12	Water Bath	Pest Culture Bacteria	Hanmett	W6131 / L1040005	Technology Promotion Association (Thailand-Japan)	2002030101	10 Feb 24	9 Feb 25	
13	Water Bath	Water Bath	ALP	CL-400 / 0001015	National Food Institute, Ministry of Industry, Thailand	200203050106	2 Apr 24	1 Apr 25	
14	Water Bath	Water Bath	ALP	CL-400 / 0001015	Technology Promotion Association (Thailand-Japan)	2002030101	7 Apr 24	6 Apr 25	
15	Analytical Balance		OMALIS	P90217 / C200204015	DOE (Thailand) Ltd.	0303030101	7 Dec 23	6 Dec 24	

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

วันที่ข้อมูลนี้ได้รับการอนุมัติให้ใช้ได้มีผลจนถึงวันที่ 31 มีนาคม 2575
ข้อมูลนี้ได้รับการตรวจสอบโดย ISO 9001:2015

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	PAT OIL AND GREASE	Mettler Toledo	AB204-SFAC7 / 112001010	Technology Promotion Association (Thailand-Japan)	2002030101	11 May 24	10 May 25
2	Analytical Balance	SUSPENDED SOLIDS	Mettler Toledo	XS2000010 / C00001010	National Food Institute, Ministry of Industry, Thailand	200203050106	2 Apr 24	1 Apr 25
3	DO Meter	BIOCHEMICAL OXYGEN DEMAND	Hanmett	9100 / 118 01003	Technology Promotion Association (Thailand-Japan)	2002030101	21 Feb 24	20 Feb 25
4	Digestion Unit	TOTAL KJELDAHL NITROGEN	Form Tissue	2000 Auto / 9170469	National Food Institute, Ministry of Industry, Thailand	200203050106	20 May 24	20 May 25
5	Hot Air Oven	TOTAL KJELDAHL NITROGEN	Hanmett	UT5 / 02120411	Technology Promotion Association (Thailand-Japan)	2002030101	1 Apr 24	31 Mar 25
6	Edison System Cooling Unit	TOTAL KJELDAHL NITROGEN	Form Tissue	KT200 / 9170024	FOSS South East Asia	8111	8 Feb 24	7 Feb 25
7	Edison System Cooling Unit	TOTAL KJELDAHL NITROGEN	Form Tissue	9100 / 118 01003	FOSS South East Asia	8111	8 Feb 24	7 Feb 25
8	pH Meter	pH	Hanmett	LAQUA-PH20 / HAN00007	Technology Promotion Association (Thailand-Japan)	2002030101	8 Feb 24	7 Feb 25

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

วันที่ข้อมูลนี้ได้รับการอนุมัติให้ใช้ได้มีผลจนถึงวันที่ 31 มีนาคม 2575
ข้อมูลนี้ได้รับการตรวจสอบโดย ISO 9001:2015

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	PAT OIL AND GREASE	Mettler Toledo	AB204-SFAC7 / 112001010	Technology Promotion Association (Thailand-Japan)	2002030101	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XS2000010 / C00001010	National Food Institute, Ministry of Industry, Thailand	200203050106	2 Apr 24	1 Apr 25
3	Analytical Balance	SUSPENDED SOLIDS	Mettler Toledo	XS2000010 / C00001010	National Food Institute, Ministry of Industry, Thailand	200203050106	2 Apr 24	1 Apr 25
4	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	HANCO	1004-1300 / 10040010201	Technology Promotion Association (Thailand-Japan)	2002030101	10 Jan 24	8 Feb 25
5	DO Meter	BIOCHEMICAL OXYGEN DEMAND	Hanmett	9100 / 118 01003	Technology Promotion Association (Thailand-Japan)	2002030101	21 Feb 24	20 Feb 25
6	Digestion Unit	TOTAL KJELDAHL NITROGEN	Form Tissue	2000 Auto / 9170469	National Food Institute, Ministry of Industry, Thailand	200203050106	20 May 24	20 May 25
7	Hot Air Oven	TOTAL KJELDAHL NITROGEN	Hanmett	UT5 / 02120411	Technology Promotion Association (Thailand-Japan)	2002030101	1 Apr 24	31 Mar 25
8	Edison System Cooling Unit	TOTAL KJELDAHL NITROGEN	Form Tissue	KT200 / 9170024	FOSS South East Asia	8111	8 Feb 24	7 Feb 25
9	Edison System Cooling Unit	TOTAL KJELDAHL NITROGEN	Form Tissue	9100 / 118 01003	FOSS South East Asia	8111	8 Feb 24	7 Feb 25
10	pH Meter	pH	V00 Environmental	911100A / A200729	Technology Promotion Association (Thailand-Japan)	2002030101	27 Sep 23	26 Sep 24

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

วันที่ข้อมูลนี้ได้รับการอนุมัติให้ใช้ได้มีผลจนถึงวันที่ 31 มีนาคม 2575
ข้อมูลนี้ได้รับการตรวจสอบโดย ISO 9001:2015

List of Instrument Certificates for Environmental Quality Analysis									
No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
1	Analytical Balance	PAF OIL AND GREASE	Mettler Toledo	AB204-G1/ACT 7 / 12001010	Technology Promotion Association (Thailand-Japan)	2402957	11 May 24	10 May 25	
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XPR205DU / C2 0052504	National Food Institute/Ministry of Industry, Thailand	2402958-001-01	2 Apr 24	1 Apr 25	
3	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XPR1205DU / C200671872	National Food Institute/Ministry of Industry, Thailand	2402958-001-01	2 Apr 24	1 Apr 25	
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 11010050	Technology Promotion Association (Thailand-Japan)	2417459	21 Feb 24	20 Feb 25	
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS	Mettler	UF5E / B212-0411	Technology Promotion Association (Thailand-Japan)	2411458	1 Apr 24	31 Mar 25	
6	pH Meter	pH	YSI Environmental	pH 100A / C202729	Association (Thailand-Japan)	2404100	27 Aug 24	25 Jul 25	

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

Unit: Analyst and Engineering Consultant Co., Ltd. (UAE)
Certified Laboratory ISO/IEC 17025

List of Instruments Certification for Environmental Quality Analysis									
No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
1	Analytical Balance	Total Suspended Particulates (TSP)	Mettler-Toledo	AB204-G1/ACT 7 / 12001010	National Food Institute, Ministry of Industry, Thailand	2402958-001-01	19 Apr 24	18 Apr 25	

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

Unit: Analyst and Engineering Consultant Co., Ltd. (UAE)
Certified Laboratory ISO/IEC 17025



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Foundation for Industrial Development
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Food Industrial Laboratory Service Center

Verification Certificate

Substitute for Certificate No.: 2402957-001-01
Certificate No.: 2402957-001-02
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Equipment: HEATING BLOCK DIGESTION
Manufacturer: FOSS
Model: 2520
Serial No.: 91794469
ID No.: UAE.WAS.011/2560
Order No.: 2402957
Operation No.: 2402957-001
Date of Receipt: 23 May 2024
Date of Calibration: 23-24 May 2024

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

Date of Issue: 18 June 2024

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 unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

FCS-011 Revision: 01 Date: 20-04-65

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List of Instruments Certification for Environmental Quality Analysis									
No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
1	Analytical Balance	Total Suspended Particulates (TSP)	Mettler-Toledo	AB204-G1/ACT 7 / 12001010	National Food Institute, Ministry of Industry, Thailand	2402958-001-01	19 Apr 24	18 Apr 25	

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

Unit: Analyst and Engineering Consultant Co., Ltd. (UAE)
Certified Laboratory ISO/IEC 17025



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 23-24 May 2024 Page 2 of 4

Location: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
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 thermocouple type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.
 - The temperature scale used was based on ITS - 90 .
 - All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A	MY4045376704189453	TC23/0048	2-Jun-2024	N.M. Technical Center Laboratory
Type R	TC/IR-182 J D1812-102				

- 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

F-C5-012 Revision: 01 Date: 20-04-65



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 23-24 May 2024 Page 3 of 4

Calibration point:

Calibration result: Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.96	378.86	2.1
2	380	380	0.40	378.41	2.1
3	380	380	1.18	378.94	2.1
4	380	380	0.44	377.64	1.6
5	380	380	0.11	377.75	1.6
6	380	380	0.14	378.35	1.6
7	380	380	1.17	377.09	2.1
8	380	380	0.33	377.08	2.1
9	380	380	0.14	375.61	2.1
10	380	380	0.96	377.74	2.1
11	380	380	0.40	377.17	2.1
12	380	380	1.18	377.71	2.1
13	380	380	0.44	379.07	1.6
14	380	380	0.11	379.19	1.6
15	380	380	0.14	379.78	1.6
16	380	380	1.17	378.74	2.1
17	380	380	0.33	378.74	2.1
18	380	380	0.14	378.27	2.1
19	380	380	0.96	379.53	2.1
20	380	380	0.40	378.96	2.1

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.

F-C5-012 Revision: 01 Date: 20-04-65



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

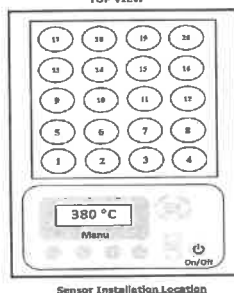
Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 23-24 May 2024 Page 4 of 4

Calibration point: 380 °C
Calibration result: Continued

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



Remark: Edited Date of Calibration from 23-24 May 2024 to 23-24 May 2024.

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 %.

F-C5-012 Revision: 01 Date: 20-04-65



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jarawit Papawuttipong
Scientist

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

Date of Issue: 9 April 2024

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-C5-009 Revision: 01 Date: 20-04-65



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



MAC
NISO-TS1-17025
CALIBRATION BODY

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:
Reference Standard Model Serial No. Calibrated By Certificate No. Due Date
Standard Weight Class E2 1mg to 200g B50567572 TCS M23040535 8 April 2024
Instrument Model Serial No. Calibrated By Certificate No. Due Date
Thermo-Hygro Meter 608-H1 NFI.0TH 016/23 Quality Reborn QR24-0343 9 February 2025

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

Calibration Results:

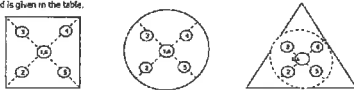
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

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



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



MAC
NISO-TS1-17025
CALIBRATION BODY

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
Unloaded	0.000003	0.00000	0.00000	0.000008	2.00
0.001	0.001003	0.00101	-0.00001	0.0000091	2.00
0.005	0.005003	0.00499	0.00001	0.0000094	2.00
0.01	0.010003	0.01000	0.00000	0.0000091	2.00
0.05	0.049996	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000003	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000025	2.00
20	20.000031	20.00002	0.00001	0.000027	2.00
30	30.000040	30.00003	0.00001	0.000032	2.00
50	50.000028	50.00004	-0.00001	0.000038	2.00
80	80.000068	80.00005	0.00002	0.000041	2.00

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



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



MAC
NISO-TS1-17025
CALIBRATION BODY

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
90	90.00010	90.0000	0.0001	0.00015	2.00
100	100.00006	100.0000	0.0001	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0000	0.0001	0.00018	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0000	0.0002	0.00028	2.00

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

----- End -----

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

FOSS

Customer Service Report

Date: 9 Feb 2024
Customer: URB
Instrument: K7200
Report No: 9810
Address: Bangkok
Serial: 91200524

Hours: Travel To Customer 08:30-10:30
Start: 08:30
Finish: 10:30
Labour: 2.0 hrs
Travel From Customer: 10:30-12:30
Start: 10:30
Finish: 12:30

Application	Special	Standard
Normal	Courtesy Visit	Installation
Distributor	PMA Onboarding	Quote
Internal	Warranty	Repair
Digital Service	Sales Support	Remote

PO/Quote Number: - If applicable

PMA Type: FOSSCPC If applicable Contract No. If applicable

Details of Work / Test	Condition / Status
# PM K7200	
- ตรวจสอบและปรับตั้ง PM	
- ตรวจสอบและปรับตั้ง PM	
- ตรวจสอบและปรับตั้ง PM	
- ตรวจสอบและปรับตั้ง PM	
- ตรวจสอบและปรับตั้ง PM	
# ตรวจสอบ PM Head ที่โรงงานของลูกค้า และปรับตั้ง	
10000325 5.0001g 100.0001g	

Instrument Ready for Use: OK Not OK If not OK - Comment

Part No.	Batch	Description	Qty
10000325	14.12.2020	Foss PM K7200 5.0001g 100.0001g	1

I confirm this report is accurate and complete
Signed FOSS: [Signature]
Signed Customer: [Signature]
Name: [Name]
Name: [Name]
Would you be willing to participate in a brief survey in order to tell us how we performed? Email

เอกสารไม่ควบคุม



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3

Cert.No.: 24TM589
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MYS7013711 23LM115 TPA 11 Jul 2024

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

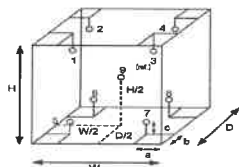
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3

Cert.No.: 24TM589
Page : 3 of 3

Result of Calibration :-

(*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.484	103.847	104.226	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.596	119.531	118.644	120.384	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.670	179.564	179.760	180.287	179.661	179.602	1.1

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 1209739



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9434



Certificate of Calibration

Cert.No.: 24MM292
Page.: 1 of 3

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : AB204-S/FACT

Serial No. : 112836101D

ID No. : UAE.WAS.002/2552

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

Location : Balance Room (108)

Received order : 11 May 2024

Calibration Date : 11 May 2024

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 90 %

Calibrated by : Khit Ruttanapachal

Approved by : Kunchit
Approved Signatory

() Ponpan Palpin
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 15 May 2024

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

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM292
Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

Instruments Model Serial No. ID No. Test report No. Due date
1) Standard Weight Set (E2) 15884 24053 70RC007 MM-0013-24 25 Jan 2026

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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

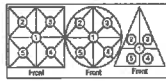
1. Determination of the standard deviation of weighing machine (n = 10)	
Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00006

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Result of calibration

Cert.No.: 24MM282
Page: 3 of 3



Maximum difference between off-center and central loading

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 24CH399
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0A0007
ID No. : UAE.EFM.0022563(EFM.pH.02/03)
Condition As-Received : Used Item
Received Date : 01 April 2024
Calibration Date : 02 April 2024
Reference : 2404-0037WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udumak 41, Sukhumvit Road,
Bangkok, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgatrakul

Approved by :
Approved Signatory

() Pornthippa Tameysakul
() Unnopphol Haraschal
(✓) Saitip Meangmal

Issue Date : 06 April 2024

The Uncertainties are for a confidence probability of approximately 95 %

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A 0062139



Cert.No.: 24CH399
Page: 2 of 3

Condition of this calibration result

- Reference Standard Instrument
Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 54030049 130RC116 23E2802 27 Aug 2024
2) Ref. Standard Thermometer 4982054 110RC044 23I908 28 July 2024

This certification is traceable to the international system of unit maintained through:
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.888	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7,10)

Unit Under Calibration	Nominal Value		Standard Voltage Input		Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH	mV	pH		
pH Meter S/N.: HA0A0007	4.00	177.48	177.5	4.01	0.058	0.058	2.00	
	7.00	0.00	0.2	6.98	0.058	0.058	2.00	
	7.00	0.00	0.2	6.98	0.058	0.058	2.00	
	10.00	-177.48	-177.3	10.01	0.058	0.058	2.00	

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a 1209881



Cert.No.: 24CH399
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: Q82M0181	4.008	4.01	180.2	0.0079	2.00
	6.888	6.98	1.3	0.0099	2.00
	6.888	7.00	-0.9	0.0098	2.00
	9.997	10.00	-188.4	0.011	2.05

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652-10D
- Serial No. : Q82M0181
- Dimension of probe
- Length : 103 mm.
- Diameter : 16 mm.
- Immersion Depth : 80 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.003	35.0	-0.003	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 %.

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a 1209882



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH1223/1
Page.: 1 of 3

Certificate of Calibration

This Certificate was issued to replace to the Certificate No.23CH1223

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.195/2561(ENV.pH.04/61)

Condition As-Received: Used item

Received Date : 26 September 2023

Calibration Date : 27 September 2023

Reference : 2309-0881WSC-1

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

Ambient Temperature : (25 ± 2.5) °C

Relative Humidity : (50 ± 15) %

Calibration Procedure : In-house method :

- CP-CH5 by direct measurement with standard

voltage calibrator and direct measurement with

certified reference material (CRM)

- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagrakul

Approved by :

Saithip
Approved Signatory

(✓) Saithip Meangmai
() Warakorn Lemgagrakul
() Ponpan Palpin

Issue Date : 16 October 2023

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0059486



Cert.No.: 23CH1223/1
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	231908	28 Jul 2024

This certification is traceable to the International System of Unit maintained through-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	913598	14 July 2025
pH 6.986	CPA chem	883833	28 Dec 2023
pH 9.987	CPA chem	913600	14 July 2024

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N: JC02729	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

Saithip
เอกสารไม่ควบคุม
a 1184884



Cert.No.: 23CH1223/1
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N: 230308SIA605377	4.008	4.01	171	0.0079	2.00
	6.986	7.00	-1	0.011	2.00
	6.986	7.00	-1	0.011	2.00
	9.987	10.01	-178	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :

- Serial No. : 230308SIA605377

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 k
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	35.001	35.0	-0.001	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 %.

-o-o-

Saithip
เอกสารไม่ควบคุม
a 1184883



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 24M/292
Page.: 1 of 3

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : AB204-S/FACT

Serial No. : 1128381010

ID No. : UAE.WAS.002/2552

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

Location : Balance Room (108)

Received order : 11 May 2024

Calibration Date : 11 May 2024

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 90 %

Calibrated by : Khiti Rutanaprapachal

Approved by :

Kunchit
Approved Signatory

() Ponpan Palpin
() Suwit Imjai
(✓) Kunchit Prompret

Issue Date : 15 May 2024

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 : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used :-

Cert.No.: 24MM282
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-0801 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard Instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

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 certificate is traceable to the International System of Unit.

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

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0008	-0.0006	0.30	2

After Adjustment :

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

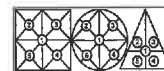
Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM282
Page: 3 of 3



2. Effect of off center loading

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

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9989	+0.0001	0.17	2.06
100	99.9989	+0.0001	0.19	2.03
150	149.9986	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL: 0-2317-3000-39 FAX: 0-2319-9484



Cert. No.: 24TM303
Page: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : Aroo
Model : UC4-1820
Serial No. : 13JRC45013201
ID No. : UAE.WAO.015/2581
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomwut 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 10 February 2024
Calibration Date : 10 February 2024
Ambient Temperature : (25 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Tawatchai Pama

Approved by :
() Pomthipha Tameyakul
(x) Unnopphol Hersachal
() Suwit Injai

Issue Date : 19 February 2024

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.



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2402-0234OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM303
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor (k)
20.0	20.1	19.9	0.37	0.72	1.4	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
20.0	19.873	19.803	20.322	19.680	19.615	19.585	19.612	19.556	19.645	0.58

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 %.

-00-



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2402-0234OC-1
Procedure Used :-

Cert. No.: 24TM303
Page : 2 of 3

Calibration was conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD). The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard Instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY58003411	23LM208	TPA	27 Dec 2024

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

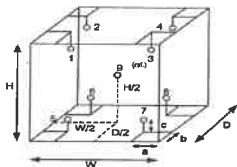
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

Dimension of Chamber :
a = 10 cm
b = 10 cm
c = 10 cm
D = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	31
REL.Humid. (%)	70	85
AC Supply (Volt)	233	234

Position :	Ref. Std. ID No.:
1	20RTD-2/1
2	20RTD-2/2
3	20RTD-2/3
4	20RTD-2/4
5	20RTD-2/5
6	20RTD-2/6
7	20RTD-2/7
8	20RTD-2/8
9 (ref.)	20RTD-2/9



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Mammet
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 : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Maiee
Approved by :
Approved Signatory
() Porpan Palpim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 5 April 2024

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 & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม
A 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Procedure Used :-

Cert. No.: 24TM589
Page : 2 of 3

Calibration was conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard Instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

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

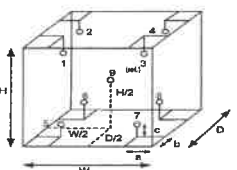
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

Dimension of Chamber :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
D = 0.50 m
W = 0.80 m
H = 0.75 m
Capacity = 0.30 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Position :	Ref. Std. ID No. @ Calibration Point
	(120 to 180) °C (104) °C
1	21-18TC-01 22-18RTD-2/1
2	21-18TC-02 18RTD-2/2
3	21-18TC-03 18RTD-2/3
4	21-18TC-04 18RTD-2/4
5	21-18TC-05 18RTD-2/5
6	21-18TC-06 18RTD-2/6
7	21-18TC-07 18RTD-2/7
8	21-18TC-08 18RTD-2/8
9 (ref.)	21-18TC-09 18RTD-2/9



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.464	103.847	104.226	104.232	104.108	103.691	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.035	120.596	119.531	119.644	120.364	120.144	120.156	1.1
180.0	180.574	179.769	180.285	180.670	179.594	179.790	180.287	179.981	179.802	1.1

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 %.

-00-

เอกสารไม่ควบคุม
a 1209739

เอกสารไม่ควบคุม
a 1209738

Cert.No.: 24TW39
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter

Manufacturer : YSI

Model : 5100

Serial No. : 11B 101863

ID No. : UAE.WAO.004/2554

Received Date : 20 February 2024

Test Date : 21 February 2024


Reference : 2402-0629DSC-1

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsakul 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10290

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %

Test Procedure : In - house method : GP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Watalek Sirithuan

Approved by : 
Approved Signatory

{ } Pornthiphe Tameyakul
{ } Ummophol Harachai
{ } Sathip Meangmal

Issue Date : 22 February 2024

เอกสารไม่ควบคุม

CerLNo.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate pentahydrate	Merck	AM1783316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

-0-

เอกสารไม่ควบคุม:

FOSS

Customer Service Report

Date:	8-3 Feb 2024		
Customer:	WAE	Address:	BANGKOK
Instrument:	KTS100	Serial:	91119052

Hours	Travel To Customer		Labour		Travel From Customer	
Start	06:00	1.5 hrs	09:50	2.5 hrs	16:00	2 hrs
Finish	09:30		12:00		18:00	

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

PD/Quote Number:	If applicable
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PMA Type	Passport, if applicable	Contract No.	if applicable
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[illegible]

Instrument Ready for Use	OK	Not OK	If not OK - Comment
--------------------------	----	--------	---------------------

Part No:	Batch	Description	Qty
6003102	13.10.2023	Rolls RM wit 3100/3100 12 no	1

I confirm this report is accurate and complete			
Signed FOSS		Signed Customer	
Name		Name	உதயா ராஜசாமி

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

เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date:	9 Feb 2014		
Customer:	UAE	Address:	Banqion
Instrument:	KJ 200	Serial:	91790524

Hours	Travel To Customer		Labour		Travel From Customer	
Start	08:00	1hr	09:30	2hrs	14:30	2hrs
Finish	09:30		12:00		16:30	

Job Type							
Application		Special		Standard			
Normal	x	Courtesy Visit	x	Installation	x	Training	x
Distributor	x	PMA Onboarding	x	Quote	x	In House	x
Internal	x	Warranty	x	Repair	x	PM	x
Direct Sendee	x	Sales Support	x	Remote	x	Other	x



PO/Quote Number:	If applicable
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PMA Type	FOI SCARC if applicable	Contract No.	if applicable
----------	-------------------------	--------------	---------------

[illegible]

Instrument Ready for Use	OK	Not OK	If not OK - Comment
--------------------------	----	--------	---------------------

Part No:	Batch	Description	Qty
1009465	19.12.2020	Pass the test lot 200 to lot of Amalgam 200	1

I confirm this report is accurate and complete			
Signed FOSS		Signed Customer	
Name		Name	

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

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udumsuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C09071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by

(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

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.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505507572	TCS	M3040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hydro Meter	508-H1	NFI.9TH 016/23	Quality Return	QR24-03/3	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000052
80	0.0000063
100	0.0000148
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unload	0.000000	0.000000	0.000000	0.0000088	2.00
0.001	0.001003	0.001010	-0.0000091	0.0000091	2.00
0.005	0.005003	0.004999	0.000004	0.0000094	2.00
0.01	0.010003	0.010000	0.000003	0.0000091	2.00
0.05	0.049995	0.050000	0.000005	0.0000095	2.00
0.1	0.100011	0.100000	0.000011	0.000011	2.00
0.5	0.500016	0.500001	0.000014	0.000014	2.00
1	1.000023	1.000002	-0.000002	0.000016	2.00
2	2.000017	2.000001	0.000016	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000020	2.00
10	10.000029	10.000000	0.000029	0.000026	2.00
20	20.000031	20.000002	0.000029	0.000037	2.00
30	30.000040	30.000003	0.000037	0.000052	2.00
50	50.000028	50.000004	-0.000004	0.000068	2.00
80	80.000068	80.000005	0.000063	0.00011	2.00

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
90	90.000019	90.00000	0.000019	0.000015	2.00
100	100.000006	100.00000	0.000006	0.000015	2.00
110	110.000007	110.00001	0.000003	0.000017	2.00
120	120.000009	120.00000	0.000009	0.000018	2.00
130	130.000019	130.00000	0.000019	0.000019	2.00
140	140.000014	140.00000	0.000014	0.000020	2.00
150	150.000009	150.00001	0.000001	0.000020	2.00
160	160.000010	160.00001	0.000000	0.000022	2.00
170	170.000012	170.00001	0.000001	0.000023	2.00
200	200.000015	200.00000	0.000015	0.000028	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 %.

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



มูลนิธิศูนย์บริการข้อมูลอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Prakhonong, Bangkok 10260

Page 2 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565


Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

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



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 2 of 4

Date of Calibration: 2 April 2024
Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 10-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 016/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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



มูลนิธิศูนย์บริการข้อมูลอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
Unload	0.000000	0.000000	0.000000	0.0000386	2.00
0.01	0.010003	0.010001	-0.000001	0.0000389	2.00
0.05	0.050003	0.050000	-0.000003	0.0000392	2.00
0.01	0.010003	0.010000	-0.000003	0.0000389	2.00
0.05	0.050003	0.050000	-0.000003	0.0000395	2.00
0.1	0.100011	0.100006	-0.000005	0.000011	2.00
0.5	0.500015	0.500001	-0.000014	0.000014	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000001	-0.000022	0.000017	2.00
5	5.000017	5.000002	-0.000015	0.000020	2.00
10	10.000009	10.000000	-0.000009	0.000026	2.00
20	20.000011	20.000000	-0.000011	0.000037	2.00
30	30.000049	30.000001	-0.000048	0.000050	2.00
50	50.000028	50.000002	-0.000026	0.000058	2.00
80	80.000068	80.000002	-0.000066	0.00011	2.00

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



มูลนิธิศูนย์บริการข้อมูลอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 4 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
90	90.000019	90.000001	-0.000018	0.000015	2.00
100	100.000006	100.000001	-0.000005	0.000015	2.00
110	110.000007	110.000001	-0.000006	0.000016	2.00
120	120.000009	120.000000	-0.000009	0.000017	2.00
130	130.000010	130.000000	-0.000010	0.000019	2.00
140	140.000014	140.000000	-0.000014	0.000020	2.00
150	150.000009	150.000001	-0.000008	0.000020	2.00
160	160.000011	160.000001	-0.000010	0.000022	2.00
170	170.000012	170.000001	-0.000011	0.000023	2.00
200	200.000016	200.000002	-0.000014	0.000028	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 %.

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

Verification Certificate

Substitute for Certificate No.: 2402957-001-01
Certificate No.: 2402957-001-02
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhantong, 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.: 2402957
Operation No.: 2402957-001
Date of Receipt: 23 May 2024
Date of Calibration: 23-24 May 2024

Calibrated by Mr.Jerawut Prapawattipong Scientist
Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 18 June 2024

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-C5-011 Revision: 01 Date: 20-04-65

Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS
Date of Calibration: 23-24 May 2024

Page 2 of 4

Location: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Environment Condition:
Ambient Temperature (25 ± 3) °C
Relative Humidity (55 ± 15) %
Line Voltage (220 ± 10) Volt

Condition of this results of Calibration:
1. This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards 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.

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A	MM405376411104103	TC23/004B	2-Jun-2024	N.M. Technical Center Laboratory
	Type R	TC105-1031010103			

3. This certificate is traceable to international system of units (SI Units).
4. This certificate was certified only for the Instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good
UUC* Description
Time of Record : Hour 30 Minute At 380 °C
7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-C5-012 Revision: 01 Date: 20-04-65

Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 23-24 May 2024
Calibration point: 380 °C
Calibration result: Continued

Page 3 of 4

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.96	378.86	2.1
2	380	380	0.40	378.41	2.1
3	380	380	1.18	378.94	2.1
4	380	380	0.44	377.64	1.6
5	380	380	0.11	377.75	1.6
6	380	380	0.14	378.35	1.6
7	380	380	1.17	377.09	2.1
8	380	380	0.33	377.08	2.1
9	380	380	0.14	376.61	2.1
10	380	380	0.96	377.74	2.1
11	380	380	0.40	377.17	2.1
12	380	380	1.18	377.71	2.1
13	380	380	0.44	379.07	1.6
14	380	380	0.11	379.19	1.6
15	380	380	0.14	379.78	1.6
16	380	380	1.17	378.74	2.1
17	380	380	0.33	378.74	2.1
18	380	380	0.14	378.27	2.1
19	380	380	0.96	379.53	2.1
20	380	380	0.40	378.95	2.1

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.

F-C5-012 Revision: 01 Date: 20-04-65

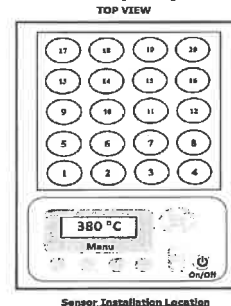
Verification Report

Certificate No.: 2402957-001-02
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS

Date of Calibration: 23-24 May 2024
Calibration point: 380 °C
Calibration result: Continued

Page 4 of 4

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



Remarks: Edited Date of Calibration from 23-24 May 204 to 23-24 May 2024.

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 %.

F-C5-012 Revision: 01 Date: 20-04-65

Calibration Certificate

Certificate No.: 2400141-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakhong, Bangkok 10260

Page 1 of 3

Equipment: CHAMBER (Hot Air Oven)
Manufacturer: MEMMERT
Model: UF 55
Serial No.: B216.1666
ID No.: UAE.WAO.027/2559
Order No.: 2400141
Operation No.: 2400141-001
Date of Receipt: 11 October 2023
Date of Calibration: 11 October 2023

Calibrated by Mr. Worapob Seoktong
Scientist
Approved by (Mr. Phraphat Tuangit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 16 October 2023

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-003 Revision: 01 Date: 20-04-05

Calibration Report

Certificate No.: 2400141-001-01
Equipment: CHAMBER (Hot Air Oven)
Model: UF 55 Serial No.: B216.1666
Resolution: 0.1 °C ID No.: UAE.WAO.027/2559
Manufacturer: MEMMERT
Date of Calibration: 11 October 2023

Page 2 of 3

Location: Laboratory, Floor 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition: Ambient Temperature (28 ± 1) °C
Relative Humidity (63 ± 2) %
Line Voltage (228 ± 1) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TIAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
- The temperature scale used was based on ITS - 90.
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument:

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 660380-01	22 April 2024	NATIONAL FOOD INSTITUTE
	RTD	CH201-209/ RTD#201-209			

- 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 1 Hour 9 Minute At 104.0, 140.0 and 180.0 °C
Fresh air Damper - Open Position -
- X Close
- Not Available
- Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-012 Revision: 01 Date: 20-04-05

Calibration Report

Certificate No.: 2400141-001-01
Equipment: CHAMBER (Hot Air Oven)
Model: UF 55 Serial No.: B216.1666
Resolution: 0.1 °C ID No.: UAE.WAO.027/2559
Manufacturer: MEMMERT

Date of Calibration: 11 October 2023 Page 3 of 3

Calibration point: 104.0, 140.0 and 180.0 °C

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Vol)
MIN	28.2	61.4	227.4
MAX	28.3	65.1	225.3

Table 1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.05	103.98	104.02	104.08	104.00	104.05	103.99	104.17	104.00	0.53
140.0	140.09	139.99	139.91	140.05	139.99	139.91	139.97	140.26	139.97	0.73
180.0	180.46	180.33	180.25	180.28	180.33	179.96	180.31	180.64	180.16	0.90

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
104.0	104.0	104.0	104.0	0.090	0.18	0.38
140.0	140.0	140.1	140.0	0.075	0.28	0.47
180.0	180.0	180.1	180.0	0.13	0.49	0.88

Note: The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) " .
UUC* = Unit Under Calibration.
Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
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.
Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.
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: 20-04-05

Certificate of Calibration

Equipment: Balance
Model: PX623
Serial No. (or ID.): C236754745 (UAE.MIC.055/2565)
Manufacturer: Ohaus
Condition: In condition
Certificate No.: C01234158
Issued Date: 08 December 2023
Job No.: WO-00011251
Page: 1 of 3

Customer: United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,
Phrakhanong District, Bangkok, THAILAND 10260

Environment Condition: Temperature 25 °C ± 0.5 °C
Humidity 54 %RH ± 1.7 %RH

Calibration Place: United Analyst and Engineering Consultant Co., Ltd. (301 Microbiology Room)
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,
Phrakhanong District, Bangkok, THAILAND 10260

Calibration By: Mr. Adisai Maknoi
Calibration Date: 07 December 2023
The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02222534

(Mr. Adisai Maknoi)
Person in Charge

(Mr. Runrod Jenkitrakulchai)
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to International or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

DKSH Technology Limited
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Phone: +66 2639 7000 Email: info@dksh.com Website: www.dksh.com/thailand
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เอกสารไม่ควบคุม
CAL-FAC01-14: 12 Sep 2022

Calibration Results:
Before Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value		Reference Points (g)				
		A	B	C	D	E
200 (g)		-	0.000	-0.003	0.000	0.001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.001 (g)

Nominal test value (g)	Standard Deviation
50	0.0006
500	0.0006

Error of Indication from nominal or conventional mass value., Readability 0.001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0013	2.10
5	5.0001	5.000	0.000	0.0013	2.10
10	10.0001	10.001	0.001	0.0013	2.10
20	20.0000	20.000	0.000	0.0013	2.08
50	50.0001	50.000	0.000	0.0013	2.08
100	100.0001	100.001	0.001	0.0013	2.09
200	200.0004	200.002	0.002	0.0014	2.07
300	300.0005	300.002	0.002	0.0015	2.05
400	400.0006	400.004	0.003	0.0016	2.03
500	500.0006	500.006	0.007	0.0019	2.02
600	600.0007	600.009	0.008	0.0021	2.01

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DKSH Technology Limited
2533 ซอยสุขุมวิท 111 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
Phone: +66 2638 7100 Email: info.asia@dksh.com Website: www.dksh.com/thailand-to-beyond

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CAL-FM-C01-14; 12 Sep 2022

After Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value		Reference Points (g)				
		A	B	C	D	E
200 (g)		-	0.001	-0.002	-0.002	0.001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.001 (g)

Nominal test value (g)	Standard Deviation
50	0.0006
500	0.0006

Error of Indication from nominal or conventional mass value., Readability 0.001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0013	2.10
5	5.0001	5.000	0.000	0.0013	2.10
10	10.0001	10.000	0.000	0.0013	2.10
20	20.0000	20.000	0.000	0.0013	2.10
50	50.0001	50.000	0.000	0.0013	2.10
100	100.0001	100.000	0.000	0.0014	2.09
200	200.0004	200.000	0.000	0.0014	2.07
300	300.0005	300.001	0.001	0.0015	2.05
400	400.0006	400.002	0.001	0.0017	2.04
500	500.0006	500.001	0.000	0.0019	2.02
600	600.0007	600.002	0.001	0.0021	2.01

The End of Certificate

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Phone: +66 2638 7100 Email: info.asia@dksh.com Website: www.dksh.com/thailand-to-beyond

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CAL-FM-C01-14; 12 Sep 2022

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The error of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, UKAS Lab14. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

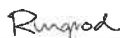
Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rules are prescribed by the customer.

Decision rule: ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.

☒ Choice B Non-binary statement with guard band ($w = 1$ U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.

☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r$ U).

; PFA – Probability of False Accept



(Mr. Runrod Jenkitrakulchai)

Authorized signatory

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CAL-FM-C01-14; 12 Sep 2022

Statements of conformity:
Before Adjustment

Readability: 0.001 g

Nominal Value g	Error of Indication g	Guard band (w) g	Tolerance (±) g	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.001	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.001	0.0013	0.200	Pass
200	0.002	0.0014	0.400	Pass
300	0.002	0.0015	0.600	Pass
400	0.003	0.0016	0.800	Pass
500	0.007	0.0019	1.000	Pass
600	0.008	0.0021	1.200	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

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DKSH Technology Limited
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Phone: +66 2638 7100 Email: info.asia@dksh.com Website: www.dksh.com/thailand-to-beyond

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CAL-FM-C01-14; 12 Sep 2022

Statements of conformity:

After Adjustment

Readability: 0.001 g

Nominal Value g	Error of Indication g	Guard band (W) g	Tolerance (Δ) g	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.000	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.000	0.0014	0.200	Pass
200	0.000	0.0014	0.400	Pass
300	0.001	0.0015	0.600	Pass
400	0.001	0.0017	0.800	Pass
500	0.000	0.0019	1.000	Pass
600	0.001	0.0021	1.200	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

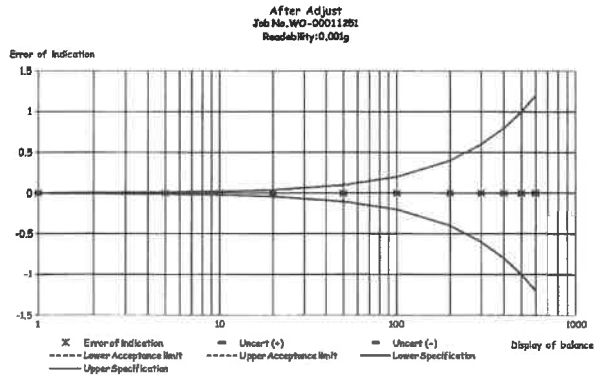
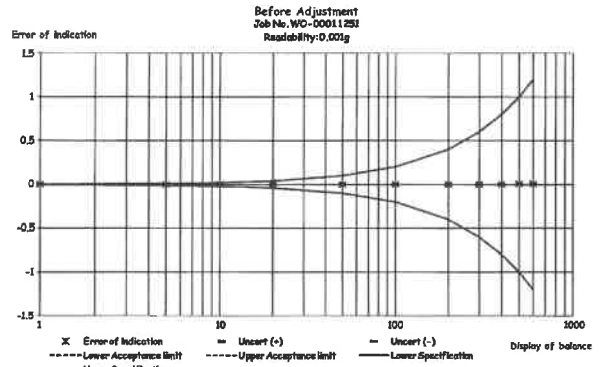
The End of Statements of conformity

บริษัท ดีเคเอสเอช (ประเทศไทย) จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10110
Phone: +66 2026 7000 Email: info@dksh.co.th Website: www.dksh.com/thailand

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CAL-FM-C01-14: 12 Sep 2022



เอกสารไมค์ควบคุม

ใบตรวจสอบสภาพเครื่องชั่ง

ชนิดเครื่องชั่ง: Balance

รุ่น: PX823

เลขที่ใบงาน: WO-00011251

หมายเลขเครื่อง: C236754745

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
07 Dec 2023			07 Dec 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<i>General</i>					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดเกรงกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดชั่งน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของชั่งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การสอบเทียบของชั่ง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หัววางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของหัวชั่งภายนอกและแผ่น load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติมของเจ้าหน้าที่:

Mr. Adisai Maknoi

Service Engineer

บริษัท ดีเคเอสเอช (ประเทศไทย) จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
2533 Sukhumvit Road, Bangkok, Phrahanong, Bangkok 10110
Phone: +66 2026 7000 Email: info@dksh.co.th Website: www.dksh.com/thailand

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
544 PATTANAKARN ROAD SOI 18, SUANLOO, SUANLUANG BANGKOK 10250
TEL: 0-2517-3000-24 FAX: 0-2514-9444



Cert. No.: 24TM303
Page: 1 of 3

Certificate of Calibration

Equipment: BOD Incubator
Manufacturer: Arco
Model: UC4-1320
Serial No.: 13URC4S013201
ID No.: UAE.WAO.015/2581
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangkok, Phrahanong,
Bangkok 10260
Location: Lab Floor 2
Received Order: 10 February 2024
Calibration Date: 10 February 2024
Ambient Temperature: (28 ± 10) °C
Relative Humidity: (50 ± 30) %
Calibrated by: Tewatchai Pana

Approved by:
() Pongthipha Tameyakul
(x) Pongthipha Tameyakul
() Suwit Injai

Issue Date: 10 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

เอกสารไมค์ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2402-0234OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM303
Page : 3 of 3

Calibration Point (°C)	UUC* (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.1	19.9	0.37	0.72	1.4	2

Calibration Point (°C)	Measured Temperature (°C)								Uncertainty (±°C)	
	Position									
	1	2	3	4	5	6	7	8		8 (ref.)
20.0	19.873	19.803	20.322	19.890	19.815	19.585	19.612	19.558	19.645	0.58

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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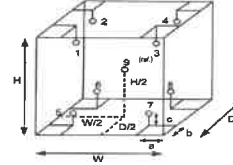
เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2402-0234OC-1
Procedure Used :-
Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.
Condition of this result of calibration

1. Reference standard Instrument:-
Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY59009411 23LM208 TPA 27 Dec 2024
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.
Remark : TPA : Technology Promotion Association (Thailand - Japan)
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	31
REL.Humid. (%)	70	65
AC Supply (Volt)	233	234



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 = 0.88 m³

Position :	Ref. Std. ID No.:
1	20RTD-2/1
2	20RTD-2/2
3	20RTD-2/3
4	20RTD-2/4
5	20RTD-2/5
6	20RTD-2/6
7	20RTD-2/7
8	20RTD-2/8
9 (ref.)	20RTD-2/9

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PAT TANAKARN ROAD SUR 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 11-2717-9000-29 FAX. 0-2719-9484



Cert. No.: 24TM28
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L41B.0808
ID No. : UAE.MIC.002/2580
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 10 February 2024
Calibration Date : 10 February 2024
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Malee

Approved by :
Approved Signatory

() Pomsithippa Tameyakul
(✓) Unnopphol Hansachul
() Suwit Imjai

Issue Date : 19 February 2024

The Uncertainties are for a confidence probability of approximately 95 %

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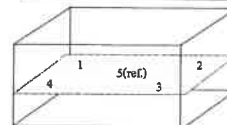
Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-0232OC-2
Procedure Used :-

Cert. No.: 24TM28
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).
The temperature scale used was based on ITS-90.

- Condition of this result of calibration
1. Reference standard Instrument:-
Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY49001451 23LM27 TPA 25 Feb 2024
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.
Remark : TPA : Technology Promotion Association (Thailand - Japan)
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Heat transfer medium used : Water

	Environmental (°C)		AC Voltage Supply (Volt)
Beginning of Calibration	28	51 %R.H.	220
Finished of Calibration	25	50	221



Front

Position :	Ref. Std. ID No.:
1	N37P301419
2	N37P300732
3	N37P301420
4	N37P301421
5(ref.)	N37P301425

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-0232OC-2
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM29
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
44.5	44.4	44.4	44.508	44.469	44.502	44.521	44.527	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.15	0.074	2

Average* : The average of 30 values in each position.
Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Stability : One-half of the greatest maximum difference of measured temperature at any one probe.
UUC* : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity.
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %.

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
2344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3091-29 FAX. 0-2719-9484



Cert. No.: 24TM30
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0812
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 : 10 February 2024
Calibration Date : 10 February 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Malee
Approved by :
() Pornthippa Temeyakul
() Unnopphol Harsathai
() Suwit Injai

Issue Date : 19 February 2024

The Uncertainties are for a confidence probability of approximately 95 %

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-0232OC-3
Procedure Used :-

Cert. No.: 24TM30
Page : 2 of 3

Calibration were conducted using In-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY40001451	23LM27	TPA	25 Feb 2024

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.

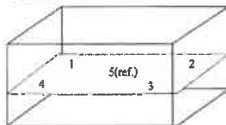
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration : (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	54	221
Finished of Calibration	26	55	220



Front

Position :	Ref. Std. ID No.:
1	N37P301419
2	N37P300732
3	N37P301420
4	N37P301421
5 (ref.)	N37P301425

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-0232OC-3
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM30
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
44.5	44.6	44.6	44.491	44.463	44.496	44.516	44.528	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.12	0.058	2

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

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

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

UUC* : Unit Under Calibration

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

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-25 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 24TM647
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E6
Serial No. : 2020000015535
ID No. : UAE.MIC.018/2564
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10250
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Ponpan Palpim
(✓) Sunit Imjai
() Kunchit Promprat

Issue Date : 7 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-00030C-6
Procedure Used :-

Cert. No.: 24TM647
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard Instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY48023632	23LM122	TPA	28 Jul 2024

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.

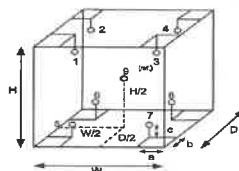
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :-

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	54	57
AC Supply (Volt)	221	223



Probe Installation Details :

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

Dimension of Chamber :

D = 0.48 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³

Position	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-00030C-6
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM647
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
35.0	35.0	35.0	0.035	0.18	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	0.30

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



มูลนิธิส่งเสริมพัฒนาอาหาร
ศูนย์ส่งเสริมและพัฒนาอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402281-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Phrakhanong, Bangkok 10260

Page 1 of 3

Equipment: Autoclave
Manufacturer: ALP
Model: CL-40L
Serial No.: 808763
ID No.: UAE.MIC.026/2563
Order No.: 2402281
Operation No.: 2402281-001
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

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

Date of Issue: 9 April 2024

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.

FCS-009 Revision: 01 Date: 20-04-65





มูลนิธิศูนย์บริการมาตรฐาน
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402281-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 808763
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563
Manufacturer: ALP
Date of Calibration: 2 April 2024

Page 2 of 3

Location: LABORATORY, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Environment Condition: Ambient Temperature (25 ± 1) °C
Relative Humidity (55 ± 7) %
Line Voltage (225 ± 5) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 3 standard temperature recorder with RTD into its autoclave and calibration according to W-TE-018 based on BS 2646-1(2021) : Autoclaves for sterilization in laboratories Design, construction, safety and performance Specification.
- The temperature scale used was based on ITS - 90
- All data show below were final values and the initial data may be obtained upon request

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with RTD (Data Logger)	HiTemp140-2	R54918	TE 560383-01	8 April 2024	NATIONAL FOOD INSTITUTE
	HiTemp140-2	S25601	TE 570033-01	9 November 2024	MADETECH INC.
	HiTemp140-2	S25602	TE 570004-01	9 November 2024	MADETECH INC.

- 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.
- This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.
- Condition of Calibrated Item : Good
- UUC Description : Setting program function sterilization : STERILIZE/NORMAL
Time of sterilization 15 Minute At 115.0 and 121.0 °C
- Result of Calibration : ☒ Without adjustment
☐ After adjustment

FCS-012 Revision: 01 Date: 20-04-65



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



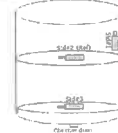
Calibration Report

Certificate No.: 2402281-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 808763
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563
Manufacturer: ALP
Date of Calibration: 2 April 2024

Page 3 of 3

Calibration point: 115.0 and 121.0 °C
Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	24.4	48.5	220
Max	25.5	62.1	230



Temperature Probes
250°C = Attached to the heat temperature probes.
250°C = 30 in the upper half of the chamber.
250°C = 30 in the bottom part, within 100 mm

Table 1 : Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.2 is REF)			Uncertainty ± (°C)
	Std.# 1	Std.# 2 (Ref)	Std.# 3	
115.0	115.28	115.35	115.38	0.64
121.0	121.28	121.36	121.37	0.64

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	Min (°C)	Max (°C)	Average (°C)			
115.0	115.0	115.1	115.0	0.08	0.19	0.48
121.0	121.0	121.1	121.0	0.12	0.10	0.38

Note

The quoted uncertainty include " Stability " and " Loading effect (20% of Uniformity) "

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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 -----

FCS-012 Revision: 01 Date: 20-04-65



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Prekhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565


Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

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.

FCS-009 Revision: 01 Date: 20-04-65



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Models: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	850556/572	TC5	N23040335	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-411	N79.BTH 016/23	Quality Reborn	QK24-0343	9 February 2025

3. This certificate is traceable to SI UNIT

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

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

Calibration Results:

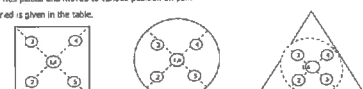
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000042
80	0.0000002
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

FCS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C710685394
ID No.: UAE.WAO.010/2565
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.00000	0.00000	0.00000	0.0000096	2.00
0.001	0.001003	0.00101	-0.00001	0.0000099	2.00
0.005	0.005003	0.00500	0.00000	0.0000092	2.00
0.01	0.010003	0.01000	0.00000	0.0000099	2.00
0.05	0.049996	0.05000	0.00000	0.0000096	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00000	0.000014	2.00
1	1.000013	1.00002	-0.00002	0.000016	2.00
2	2.000022	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00000	0.00003	0.000037	2.00
30	30.000040	30.00001	0.00003	0.000050	2.00
50	50.000028	50.00002	0.00000	0.000058	2.00
80	80.000068	80.00002	0.00005	0.00011	2.00

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

12

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C710685394
ID No.: UAE.WAO.010/2565
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00010	90.0001	0.0000	0.00015	2.00
100	100.00006	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00016	2.00
120	120.00009	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0002	0.0000	0.00028	2.00

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

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

End

12



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2718-9484



Certificate of Calibration

Cert. No.: 24TM550
Page : 1 of 3

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V816.0068

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 : 01 April 2024
Calibration Date : 02 - 03 April 2024
Ambient Temperature : $(28 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Man Paitanapongpaiboon

Approved by : 
Approved Signatory

() Ponpan Paipim
(✓) Sunth Injai
() Kunchit Promprat

Issue Date : 7 April 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-2

Cert. No.: 24TM550
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	23LM122	TPA	26 Jul 2024

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.

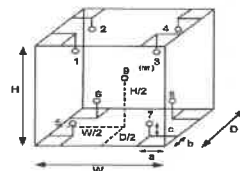
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	57	54
AC Supply (Volt)	221	222



Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.50 m
b = 5.0 cm W = 0.84 m
c = 5.0 cm H = 0.80 m
Capacity = 0.26 m³

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	19-16RTD-04
5	19-16RTD-05
6	19-16RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-003OC-2
Result of Calibration : (°) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM050
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
25.0	25.0	25.0	0.053	0.78	1.3	2
36.0	36.0	36.0	0.14	0.57	0.93	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
25.0	25.596	25.310	25.439	25.412	24.347	24.332	24.313	24.414	24.875	0.30
36.0	35.843	35.985	35.618	35.701	36.239	36.260	36.343	36.357	36.063	0.31

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 %.

-000-

เอกสารไม่ควบคุม



มูลนิธิสถาบันพัฒนาอุตสาหกรรมอาหาร
ศูนย์บริการทดสอบปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402420-003-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10250

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS204TS/00

Serial No.: C252436235

ID No.: UAE.AIR.023/2566

Order No.: 2402420

Operation No.: 2402420-003

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by Mr. Pheraphat Tuanjit
Scientist

Approved by *P. Jungsakulit*
(Miss Preyaporn Jeengkamkit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

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



มูลนิธิสถาบันพัฒนาอุตสาหกรรมอาหาร
ศูนย์บริการทดสอบปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402420-003-01

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: MS204TS/00
Resolution: 0.0001 g
Serial No.: C252436235
ID No.: UAE.AIR.023/2566
Capacity: 220 g

Date of Calibration: 19 April 2024 Page 2 of 3

Environment Condition: Ambient Temperature: 21.7 ± 1.5 °C Relative Humidity: 65 ± 6.7 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-NA-001 In-House Method based on UKAS Lab 11 : 3319

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M23111515	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M23111825	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	W187H 019/23	Quality Room	QR24-0492	4 March 2025

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000074
200	0.000074

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.
The balance reading obtained is given in the table.

1	2	3
4	5	6
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
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73	74	75
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532	533	534
535	536	537
538	539	540
541	542	543
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583	584	585
586	587	588
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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
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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



CERTIFICATE OF CALIBRATION

Certificate No. : SP24-018

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

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

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009

ID No. : UAE.WAT.020/2558

Received Date : 7 May 2024

Calibration Date : 7 May 2024

Issue Date : 9 May 2024

Condition Instrument : Good

Calibrated by :

(Mr. Tanawat Rittidach)

Technical Manager

Approved by :

(Ms. Chonbicha Sangngem)

Quality Manager

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

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

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °CRelative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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

Institute of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 60 nm/min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5780	0.5747	0.0033	0.0031	2.00
	1.0484	1.0438	0.0046	0.0029	2.00
	2.1876	2.1832	0.0044	0.0080	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5595	0.5581	0.0014	0.0034	2.00
	1.0239	1.0231	0.0008	0.0035	2.00
	2.1230	2.1219	0.0011	0.0080	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5230	0.5184	0.0046	0.0030	2.00
	0.9633	0.9614	0.0019	0.0029	2.00
	1.9753	1.9731	0.0022	0.0070	2.00
546.1	0.0000	0.0000	0.0000	0.0028	2.00
	0.5181	0.5150	0.0031	0.0031	2.00
	1.0002	0.9964	0.0038	0.0033	2.00
	1.9973	1.9914	0.0059	0.0088	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5517	0.5485	0.0032	0.0030	2.00
	1.0803	1.0772	0.0031	0.0030	2.00
	2.0373	2.0293	0.0080	0.0080	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5591	0.5565	0.0026	0.0031	2.00
	1.0518	1.0482	0.0036	0.0030	2.00
	1.9274	1.9202	0.0072	0.0079	2.00

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.0000	0.0000	0.0050	2.00
	0.7469	0.7435	0.0034	0.0057	2.00
257	0.0000	0.0000	0.0000	0.0050	2.00
	0.8674	0.8639	0.0035	0.0060	2.00
313	0.0000	0.0000	0.0000	0.0050	2.00
	0.2919	0.2907	0.0012	0.0051	2.00
350	0.0000	0.0000	0.0000	0.0050	2.00
	0.6430	0.6402	0.0028	0.0055	2.00

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

Certificate No.: SP24-018

Page 5 of 5

Wavelength Accuracy :

CRMa Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.9	-0.09	0.18	2.00
334.06	333.9	0.16	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	418.1	0.49	0.18	2.00
445.94	445.6	0.34	0.18	2.00
453.66	453.3	0.36	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.0	0.59	0.18	2.00
637.98	638.7	-0.72	0.18	2.00
431.38	430.8	0.58	0.18	2.00
472.50	472.4	0.10	0.18	2.00
513.47	513.7	-0.23	0.18	2.00
528.88	529.1	-0.22	0.18	2.00
573.17	573.5	-0.33	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	685.1	-0.70	0.18	2.00
740.72	741.4	-0.68	0.20	2.00
748.55	749.1	-0.55	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.3	-0.02	0.18	2.00

Remark : -UUC = Unit Under Calibration

- N/A = Not Available

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

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

- * Indicates non TISI accredited

- End of Certificate -

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 2: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2718-9484



Certificate of Calibration

Cert.No.: 24MM283

Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : XSR204
Serial No. : C117635043
ID No. : UAE.WAS.012/2564
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Set Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10280
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 16 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khit Rutanaprapachai
Approved by :
Approved Signatory
() Ponpan Palpin
() Suwit Imjai
(✓) Kunchit Promprat
Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-2
Procedure used :-

Cert.No.: 24MM283

Page: 2 of 3

Calibration was conducted using In-house calibration procedure CP-DB01 based on UKAS LAB 14
according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

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

3. This result of calibration was made on request 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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.27	2.03
200	200.0001	-0.0001	0.31	2

After Adjustment :

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

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00007



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-2

Cert.No.: 24MM283

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

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
+0.0002	-0.0001	0.0000	+0.0002	0.0000	0.0003

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
5	5.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
20	20.0000	-0.0000	0.19	2.03
50	50.0001	-0.0001	0.19	2.06
60	60.0001	-0.0001	0.19	2.04
80	80.0001	-0.0001	0.27	2
100	100.0002	-0.0002	0.27	2.03
120	120.0001	-0.0001	0.29	2
200	200.0001	-0.0001	0.31	2

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

เอกสารไม่ควบคุม



Certificate of Calibration

Cert. No.: 24TM835
Page : 1 of 3

Equipment : Autoclave
Manufacturer : ALP
Model : CL-40L
Serial No. : 810010
ID No. : UAE.MIC.032/2565
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : 301 Room
Received Order : 07 June 2024
Calibration Date : 07 June 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (60 ± 30) %
Calibrated by : Khit Rutanaprapachai
Kunchit
Approved by :
() Ponpan Palpin
() Suwit Injai
(✓) Kunchit Prompratt

Issue Date : 11 June 2024

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 & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2406-01800C-1
Procedure Used :-

Cert. No.: 24TM835
Page : 2 of 3

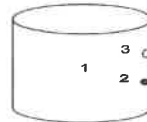
Calibration were conducted using in-house calibration procedure CP-0703 Based on BS 2646-5 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	23LM73	TPA	18 May 2025

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.
Remark : TPA : Technology Promotion Association (Thailand - Japan)
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	26	58	222
Finished of Calibration	27	61	221

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	23-01TC-08
2 =	Temperature sensor	23-01TC-09
3 =	Exhaust port	23-01TC-10

เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2406-01800C-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM835
Page : 3 of 3

Operating parameter Set : Temperature = 115.0 °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 k
115.0	115.0	1	115.288	0.17	0.09	0.75	2
		2	115.252				
		3	115.317				

Operating parameter Set : Temperature = 121.0 °C
Sterilization period = 20 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
121.0	121.0	1	121.088	0.24	0.13	0.75	2
		2	121.119				
		3	121.121				

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



มูลนิธิส่งเสริมและพัฒนาอาหาร
มูลนิธิส่งเสริมและพัฒนาอาหาร
Foundation for Industrial Development National Food Institute
Food Institute Laboratory Service Center

Verification Certificate

Certificate No.: 2404228-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 4

Equipment: Digestion Unit (Heating Block)
Manufacturer: VELP SCIENTIFICA
Model: DKL20
Serial No.: 213517
ID No.: UAE.WAS.005/2555
Order No.: 2404228
Operation No.: 2404228-001
Date of Receipt: 26 August 2024
Date of Calibration: 26-27 August 2024

Calibrated by Mr. Worapob Sookthong
Scientist
Approved by (Mr. Phersaphat Tuenjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 30 August 2024

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.

FCS-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม



ศูนย์บริการและสนับสนุนทางเทคนิค
ศูนย์บริการและสนับสนุนทางเทคนิค
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2404228-001-01
Equipment: Digestion Unit (Heating Block)
Model: DKL20 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VELP SCIENTIFICA
Date of Calibration: 26-27 August 2024 Page 2 of 4

Location: Dry Laboratory (312), UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Environment Condition:
Ambient Temperature (29 ± 1) °C
Relative Humidity (60 ± 2) %
Line Voltage (224 ± 1) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert standard thermocouples type R into its Digestion blocks and Calibration according to NFI Method WI-TE-026 based on BS 4309 : 1968
- The temperature scale used was based on ITS - 90 .
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	3497CA	MY4404576/NY4194453	TC24/0063	5-Jun-2025	N.M. Technical Center Laboratory
Type R	R/CH1 to R/CH3				

- 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 1 Hour 6 Minute At 380 °C

- Result of Calibration : ☒ Without adjustment ☐ After adjustment

FCS-012 Revision: 01 Date: 20-04-55



ศูนย์บริการและสนับสนุนทางเทคนิค
ศูนย์บริการและสนับสนุนทางเทคนิค
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2404228-001-01
Equipment: Digestion Unit (Heating Block)
Model: DKL20 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VELP SCIENTIFICA
Date of Calibration: 26-27 August 2024 Page 3 of 4

Calibration point:

Calibration result:

Table 1 : Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (± °C)	Standard Thermometer (°C)	Uncertainty (± °C)
1	380	380	0.21	380.14	2.0
2	380	380	0.21	380.70	2.0
3	380	380	0.12	381.17	2.0
4	380	380	0.12	379.82	2.0
5	380	380	0.20	381.01	2.0
6	380	380	0.16	380.48	2.0
7	380	380	0.19	379.35	2.0
8	380	380	0.25	380.27	2.0
9	380	380	0.17	382.28	2.0
10	380	380	0.35	380.98	2.0
11	380	380	0.30	380.35	2.0
12	380	380	0.23	382.38	2.0
13	380	380	0.17	378.95	2.0
14	380	380	0.18	379.69	2.0
15	380	380	0.16	382.06	2.0
16	380	380	0.14	380.14	2.0
17	380	380	0.16	381.09	2.0
18	380	380	0.15	382.71	2.0
19	380	380	0.25	381.32	2.0
20	380	380	0.25	381.21	2.0

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 %.

FCS-012 Revision: 01 Date: 20-04-55



ศูนย์บริการและสนับสนุนทางเทคนิค
ศูนย์บริการและสนับสนุนทางเทคนิค
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2404228-001-01
Equipment: Digestion Unit (Heating Block)
Model: DKL20 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VELP SCIENTIFICA
Date of Calibration: 26-27 August 2024 Page 4 of 4
Calibration point: 380 °C
Calibration result: Continued

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

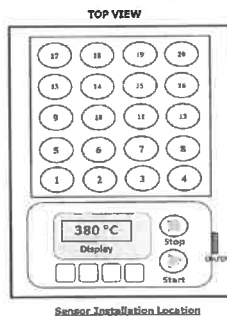


Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit

FCS-012 Revision: 01 Date: 20-04-55

FOSS

Customer Service Report

FOSS South East Asia
3388 Srinakul Building, 25th - 26th Floor, Unit No. 3388/20,
Rama IV Road, Klongton, Klongtoey, Bangkok, Thailand 10110

Report No: 8411

Date: 21/05/23

Customer: UAE

Instrument: K-T8100

Address: Bangkok, Thailand

Serial: 91899052

Hours
Start: 07:00
Finish: 15:00

Labour
06:00
15:00

Travel From Customer
15:30
18:30

Application	Special	Standard
Normal	✓	✓
Distributor	✓	✓
Internal	✓	✓
Digital Service	✓	✓

PG/Quote Number: 14340000

PMA Type: 14340000 Contract No.: 14340000

Details of Work / Test	Condition / Status
- Wash Function Int. operation PM	OK
- Wash Function Part 1: Wash PM - 1st 100% OK	OK
- Wash Function Part 2: Wash PM - 2nd 100% OK	OK
- Wash Function Part 3: Wash PM - 3rd 100% OK	OK
- Wash Function Part 4: Wash PM - 4th 100% OK	OK
- Wash Function Part 5: Wash PM - 5th 100% OK	OK
- Wash Function Part 6: Wash PM - 6th 100% OK	OK
- Wash Function Part 7: Wash PM - 7th 100% OK	OK
- Wash Function Part 8: Wash PM - 8th 100% OK	OK
- Wash Function Part 9: Wash PM - 9th 100% OK	OK
- Wash Function Part 10: Wash PM - 10th 100% OK	OK
- Wash Function Part 11: Wash PM - 11th 100% OK	OK
- Wash Function Part 12: Wash PM - 12th 100% OK	OK
- Wash Function Part 13: Wash PM - 13th 100% OK	OK
- Wash Function Part 14: Wash PM - 14th 100% OK	OK
- Wash Function Part 15: Wash PM - 15th 100% OK	OK
- Wash Function Part 16: Wash PM - 16th 100% OK	OK
- Wash Function Part 17: Wash PM - 17th 100% OK	OK
- Wash Function Part 18: Wash PM - 18th 100% OK	OK
- Wash Function Part 19: Wash PM - 19th 100% OK	OK
- Wash Function Part 20: Wash PM - 20th 100% OK	OK

Part No.	Batch	Description	Qty
14340000	14340000	Wash PM - 1st 100% OK	1

I confirm this report is accurate and complete
Signed FOSS: [Signature]
Signed Customer: [Signature]
Name: [Name]
Name: [Name]

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

เอกสารไม่ควบคุม



Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.195/2561(ENV.pH.04/61)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-082WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgagrakul

Approved by : _____
Approved Signatory

() Unnophol Harachai
() Porpan Palpim
(✓) Saitip Meangmai

Issue Date : 29 August 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC052	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188060	130RC044	2311216	10 Oct 2024

- This Certification is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lange GmbH LI
Deutsche Akkreditierungsstelle, Accredited No.D-RAI-15184-01-00

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
			mV	pH		
pH Meter S/N: JC02729	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



Cert.No.: 24CH1070
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N: 231018SIA05377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : _____
- Serial No. : 231018SIA05377
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 (\pm °C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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 %.

-000-



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Kuntit Ruttanapreapachai
Approved by :
() Porpan Palpin
() Suwit Imjai
(✓) Kuntit Promprat
Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%
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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used :-

Cert.No.: 24MM292
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-08C1 based on UKAS LAB 14
according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard Instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- 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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg) (k)	Coverage Factor
100	100.0000	0.0000	0.19	2.03
200	200.0008	-0.0006	0.30	2

After Adjustment :

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

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00006

เอกสารไม่ควบคุม



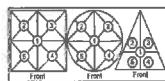
Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM292
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)
0.0001

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg) (k)	Coverage Factor
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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 %.

-086-

เอกสารไม่ควบคุม



Certificate of Calibration

Cert. No.: 24TM589
Page: 1 of 3

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
Lab Floor: 2
Location :
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Meiea
Approved by :
() Porpan Palpin
(✓) Suwit Imjai
() Kuntit Promprat
Issue Date : 5 April 2024

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 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Cert. No.: 24TM589
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY57013711 23LM115 TPA 11 Jul 2024

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

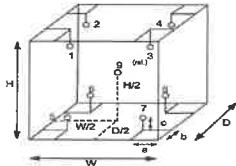
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close
Cert. No.: 24TM589
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.484	103.847	104.228	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.488	120.089	120.835	120.598	119.531	119.844	120.394	120.144	120.158	1.1
180.0	180.574	179.789	180.285	180.870	179.594	179.790	180.257	179.961	179.802	1.1

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 1209739



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3809 FAX. 0-2715-9484

Cert.No.: 24TW39
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0628DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road, Bangchak,
Phrekanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Watsak Sirithuan

Approved by :
Approved Signatory

() Ponthipha Taneyakul
() Unnophol Harachai
(✓) Sathip Meangmal

Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23OG1172	22 Mar 2026
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

Material	Manufacturer	Lo.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1783318	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titrimetric Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study
Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced
other in full without written approval of the laboratory

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เอกสารไม่ควบคุม



ศูนย์บริการและพัฒนาอุตสาหกรรม
กรมส่งเสริมการค้าระหว่างประเทศ
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 43, SUKHUMVIT ROAD,
Bangchack, Prakhong, Bangkok 10260

Page 3 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565


Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prepawuttipong
Scientist

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

Date of Issue: 9 April 2024

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



ศูนย์บริการและพัฒนาอุตสาหกรรม
กรมส่งเสริมการค้าระหว่างประเทศ
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 2 of 4

Date of Calibration: 2 April 2024

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standard:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	E505597572	YCS	MZ.M40535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-M1	NFI.BTH.016/23	Quality Reborn	Q124-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

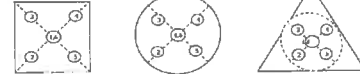
1. Repeatability of Reading:

Normal Value (g)	Standard Deviation of Reading (g)
43	0.000042
80	0.000052
136	0.000048
236	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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



ศูนย์บริการและพัฒนาอุตสาหกรรม
กรมส่งเสริมการค้าระหว่างประเทศ
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 3 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unload	0.000000	0.000000	0.000000	0.0000086	2.00
0.001	0.001003	0.001011	-0.000008	0.0000089	2.00
0.005	0.005003	0.005000	0.000003	0.0000092	2.00
0.01	0.010003	0.010000	0.000003	0.0000089	2.00
0.05	0.050006	0.050000	0.000006	0.0000096	2.00
0.1	0.100011	0.100000	0.000011	0.000011	2.00
0.5	0.500016	0.500000	0.000016	0.000014	2.00
1	1.000003	1.000002	-0.000002	0.000016	2.00
2	2.000013	2.000001	0.000012	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000020	2.00
10	10.000006	10.000000	0.000006	0.000026	2.00
20	20.000031	20.000000	0.000031	0.000037	2.00
30	30.000048	30.000001	0.000047	0.000050	2.00
50	50.000078	50.000002	0.000076	0.000098	2.00
80	80.000068	80.000002	0.000066	0.000111	2.00

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



ศูนย์บริการและพัฒนาอุตสาหกรรม
กรมส่งเสริมการค้าระหว่างประเทศ
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 4 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
90	90.000010	90.000000	0.000010	0.000015	2.00
100	100.000006	100.000001	0.000005	0.000015	2.00
110	110.000007	110.000001	0.000006	0.000016	2.00
120	120.000009	120.000000	0.000009	0.000017	2.00
130	130.000010	130.000000	0.000010	0.000019	2.00
140	140.000014	140.000000	0.000014	0.000020	2.00
150	150.000009	150.000001	0.000008	0.000026	2.00
160	160.000019	160.000001	0.000018	0.000022	2.00
170	170.000012	170.000001	0.000011	0.000023	2.00
200	200.000016	200.000002	0.000014	0.000028	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 %.

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





Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.195/2561(ENV.pH.04/61)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-0882WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchek, Phraekhong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lomgagtrakul

Approved by :

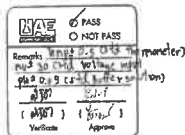
Approved Signatory

() Unnopphol Harachal
() Ponpan Palpim
(✓) Salthip Meangmai

Issue Date : 28 August 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC062	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	231216	10 Oct 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

: The measurement results are traceable to SI through Hach Lange GmbH LI
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15154-01-00

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	mV	pH		
pH Meter S/N: JC02729	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	



Cert.No.: 24CH1070
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N: 231018SIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :

- Serial No. : 231018SIA605377

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 (\pm °C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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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Certificate of Calibration

Cert. No.: 24TM847
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E8
Serial No. : 2020000015535
ID No. : UAE.MIC.018/2564
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakhonong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Ponpan Paipim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 7 April 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6
Procedure Used :-

Cert. No.: 24TM847
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard Instrument:-
Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY49023832 23LM122 TPA 26 Jul 2024

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.

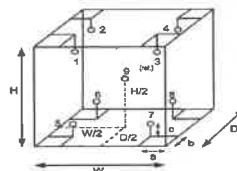
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	54	57
AC Supply (Volt)	221	223



Probe Installation Details :

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

Dimension of Chamber :

D = 0.48 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM847
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	0.30

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



มูลนิธิส่งเสริมวิทยาศาสตร์และเทคโนโลยีในอาหาร
ศูนย์บริการการวิจัยและการทดสอบอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

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

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %
Place of Calibration: Laboratory, UNITED ANALYSIS AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Result of Calibration:

1. Calibration Method: NFI Method V1-MA-001 In-house Method based on UKAS Lab 14 : 2015

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	B50556752	TCS	M23040535		8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 016/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000043
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan:

The balance reading obtained is given in the table.

1	2	3
(g)	(g)	(g)
100.0002	100.0001	100.0002
99.9999	100.0001	100.0001
		(Maximum Difference)
		0.0003

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unload	0.000000	0.000000	0.000000	0.0000088	2.00
0.001	0.001003	0.001011	-0.000011	0.0000091	2.00
0.005	0.005003	0.004999	0.000004	0.0000094	2.00
0.01	0.010003	0.010000	0.000003	0.0000093	2.00
0.05	0.049995	0.050000	0.000005	0.0000098	2.00
0.1	0.100011	0.100000	0.000011	0.0000111	2.00
0.5	0.500016	0.500001	0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000002	0.000016	2.00
2	2.000003	2.000001	0.000002	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000020	2.00
10	10.000009	10.000000	0.000009	0.000026	2.00
20	20.000031	20.000002	0.000029	0.000037	2.00
30	30.000043	30.000007	0.000036	0.000052	2.00
50	50.000028	50.000004	0.000024	0.000068	2.00
80	80.000065	80.000005	0.000060	0.000111	2.00

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00013	90.00009	0.00004	0.00015	2.00
100	100.00006	100.00000	0.00006	0.00015	2.00
110	110.00007	110.00001	0.00006	0.00017	2.00
120	120.00009	120.00000	0.00009	0.00018	2.00
130	130.00010	130.00009	0.00001	0.00019	2.00
140	140.00014	140.00009	0.00005	0.00020	2.00
150	150.00005	150.00001	0.00004	0.00020	2.00
160	160.00010	160.00001	0.00009	0.00022	2.00
170	170.00012	170.00001	0.00011	0.00023	2.00
200	200.00016	200.00000	0.00016	0.00028	2.00

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

***** End *****

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

Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the installation.

Note: While non-current production AA instrument and/or accessory models are not covered specifically in this document it can be used as a basic reference.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.agilent.com/en-us/services>

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

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Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>
- Need technical support, FAQs, supplies? – visit our Support Home page at <http://www.agilent.com/search/support>
- Get answers. Share insights. Build connections. Join the Agilent Community at <https://community.agilent.com/welcome>

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice.

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Instrument Maintenance

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table:

Instrument System Name and ID

Instrument System Size and Location

UNITED ANALYST AND ENGINEERING CONSULTANT / 2nd Lab

List System Component Product Numbers

- 6 9432 A
-
-
-
-
-
-
-
-

List the Serial Numbers of each Component

17 016 0001

Preparation, Safe operation and Initial performance checks

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Preventive Maintenance Introduction

FLAME SYSTEM section

- ☐ Section not applicable

Electronic components

- ☒ Review and confirm instrument configuration data in SVD
- ☒ Confirm power supply voltages using the SVD Power Supply diagnostic
- ☒ For Dual Beam Instruments - Confirm RBC frequency using the SVD RBC frequency diagnostic

Mechanical components

- ☒ Check the burner adjuster controls for complete and firm movement. If the burner adjuster needs lubrication, use Molykote 571 or mineral-based molybdenum disulfide grease.
- ☒ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☒ Monochromator drive
 - ☒ Slit drive
 - ☒ Lamp selector
 - ☐ ABA N/A

Optics components

- ☒ Check that all named optical surfaces are clean – Clean or replace as required.
- ☒ Use SVD and perform Mono Wavelength Correction.
- ☒ Use SVD and perform Slit Calibration.
- ☒ Use SVD and perform Grating Squaresness Diagnostic.
- ☒ Use SVD and perform Zero Order Offset/Mono Correction.
- ☒ Use SVD and perform Wavelength Repeatability.
- ☒ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age
- ☒ Check that the signal energy of the CD and HC lamps track precisely. Advise customer if their CD lamp is showing emission degradation due to age.

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Sample Introduction and Atomization

- ☒ Inspect the burner interlock plate to ensure that the interlock pin is secure and correct for the burner type.
- ☒ Clean the burner slot with a clean white card.
- ☒ Check the uniformity of the slot width.
- ☒ Clean the burner if required.
- ☒ Change the burner o-ring.
- ☒ Clean the nebulizer, spray chamber and liquid trap.
- ☒ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ☒ Check that the pressure relief bung releases readily.
- ☒ Change o-rings on the fuel and oxidant delivery bars
- ☒ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ☒ Refill the liquid trap and check that overflow drains freely into the drain/waste tube.
- ☒ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
- ☒ Check and clean the igniter electrode

Gas handling components and safety interlocks

- ☒ Pressure test for leaks
- ☒ Leak test gasox internal components and connections
- ☒ Check safety interlock status and operation using the SVD interlock monitoring diagnostic.

Analytical performance for Flame systems

- ☒ Ignite a flame.
- ☒ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
- ☒ Optimize the instrument ready to perform Cu sensitivity test.
- ☒ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing"
- ☒ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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FURNACE SYSTEM section

☒ Section not applicable

Electronic components

- ☐ Review and confirm instrument configuration data in SVD
- ☐ Confirm power supply voltages using the SVD Power Supply diagnostic.

Mechanical components

- ☐ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☐ Monochromator drive
 - ☐ Silt drive
 - ☐ Lamp selector

Optics components

- ☐ Check that external optical surfaces are clean – Clean or replace as required.
- ☐ Use SVD and perform *Mono Wavelength Correction*.
- ☐ Use SVD and perform *Silt Calibration*.
- ☐ Use SVD and perform *Grating Squereness Diagnostic*.
- ☐ Use SVD and perform *Zero Order Offset/Mono Correction*.
- ☐ Use SVD and perform *Wavelength Repeatability*.
- ☐ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.

Gas handling, water system and workhead component checks

- ☐ Inspect the GTA workhead gas hoses and connections for leaks.
- ☐ Pressure test for gas leaks
- ☐ If the cooler system is accessible (stand-alone) check for correct operation and coolant/water level – this includes any temperature and pressure settings plus filter cleaning (air flow and water).
- ☐ Inspect the GTA workhead water hoses and connections for leaks.
- ☐ Check all graphite components and replace if necessary.

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- ☐ Tube
- ☐ Electrodes
- ☐ Shroud

- ☐ Check and clean the end windows on the workhead.
- ☐ Check safety interlock operation.

Analytical performance for Furnace systems

- ☐ Optimize the instrument ready to perform Cu sensitivity test.
- ☐ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

☒ Section NOT Applicable

- ☐ Check condition of the PSD capillary – replace if necessary
- ☐ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ☐ Change PSD rinse bottle o-ring.
- ☐ Check and clean the rinse vessel.
- ☐ Check the drain tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel.
- ☐ Ensure that the waste vessel is suitable for use with the furnace system.

Sample introduction pump system (SIPS) accessory

☒ Section NOT Applicable

- ☐ Re-torque screws securing the hubs, pressor arms and pump rotors.
- ☐ Adjust each roller so that it rotates freely
- ☐ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth.
- ☐ Ensure that the pressor arms and the surfaces near the pump are free from dirt and spills.
- ☐ Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion.
- ☐ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ☐ Check clips securing the diluents holder and replace if necessary.
- ☐ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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- ☐ Remove the T-piece by disconnecting the pump tubes, the pump bands and all other tubing.
- ☐ Place the T-piece in an ultrasonic bath containing strong detergent 1-5% Decon 30 or similar, for approximately 5-10 minutes.
- ☐ Wash the T-piece under a tap with a strong flow of water.
- ☐ Rinse with distilled water through all of the inlets in the reverse direction to normal sample flow.
- ☐ Reassemble.

Sample preparation system (SPS 4) accessory

☒ Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler:

- ☐ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent.
- ☐ Cleaning the autosampler cover panels with domestic window cleaner.
- ☐ Checking the X- axis and Z- axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Check the X- axis, Theta- axis and Z- axis FFC cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.

For further details refer to the SPS 4 service manual G8410-90050.

Sample preparation system (SPS 3) accessory

☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions - adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions - Calibrate if required
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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Vapor generation accessory VGA (hydride generator)

☒ Section NOT Applicable

- ☐ Inspect VGA gas supply hose.
- ☐ Inspect/replace VGA pump tubing.
- ☐ Check low gas pressure interlock setting – adjust if required.
- ☐ Check precision orifice gas flow setting – adjust if required.
- ☐ Check gas regulator pressure to 46 psi (325 kPa) – adjust if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

AA lamp accessory (external)

☒ Section NOT Applicable

- ☐ Check the condition of the power cable.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

- ☒ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

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Signature Page

Service Review

- ☒ Attach available reports/printsouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Uninterested instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Provide this meter parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.

Test Results

Test Description		
Flame optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width:	< 55 %	44 %
Flame performance test with 5 ppm copper sample		
Air /acetylene, mixing paddle removed	Abs value > 0.5	0.7401 A
Air /acetylene, mixing paddle installed, 10 replicates	%RSD < 1.0	0.5 % RSD
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width:	< 55 %	N/A
Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0 %	N/A
Abs value	≥ 0.15	N/A
Zeeman furnace analytical performance: 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0 %	N/A
Abs value	≥ 0.10	N/A
MSR%	≥ 70 %	N/A

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AA consumable and parts list table

Part Description	Product/Model # where used	PM supplied or Consumable	Instrument Type
Test Solution - Cu 5ppm solution	6610030100	PM supplied	Common
Test Solution - Blank solution	5190-7001	PM supplied	Common
Copper, 1000 ug/ml, 100ml	5190-8279	*	Common
Kit, Kit 7 O-rings, aqueous, complete set	9910093400	PM supplied	Flame
Organic Kit	9910093500	PM supplied	Flame
Wire Nebulizer Cleaning	9910024700	consumable	Flame
Tubing-Capillary Std Neb	9910024800	consumable	Flame
Capillary Tube Hvac Neb (3) (organics only)	9910044000	consumable	Flame
Glass impact beads (5/pkg)	9910025700	consumable	Flame
Tellon impact beads (5/pkg) (organics only)	9910053300	consumable	Flame
Burner cleaning strip (100/pkg)	9910053900	consumable	Flame
Window UV silica - round (right side)	2010082600	PM supplied	Common
Window UV silica - rectangular (left side)	2010082500	PM supplied	Common
Pad adhesive window (round)	4010012700	PM supplied	Common
Pad adhesive window (rectangular)	4010012800	PM supplied	Common
Electrode kit (1 pr) (D2)	6310003400	PM supplied	Furnace
Shroud (D2)	6310003100	PM supplied	Furnace
Zeeman electrode kit (1 pr)	6310003500	PM supplied	Furnace
Zeeman shroud	6310003600	PM supplied	Furnace
O-ring, PDSB bottle	6910025900	PM supplied	Furnace

* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM. Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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Service Engineer Comments (optional)

Service Completion

Service request number: 6006371115 Date service completed: 24 January 2024
Agilent signature: Worawit T. Customer signature: Javida
Total number of pages in this document: 13

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SVD Results Report



Customer:

Service Engineer: Worawit T.

Address:

Contact Details:

Instrument Configuration

Configuration:

Serial Number: MY13160001

Turret Type: Automatic

Instrument Model: Varian AA140/240/280

Number Of Lamps: 4

Flame Instrument: True

Mono Type: Automatic

Furnace Instrument: True

Gasbox Type: Y Gas Box

Zeeman Present: False

Auto Burner Adjuster: False

Internal Zeeman: False

Mains Frequency: 60

Internal UltraAA: False

Firmware Version: 2.11

Optics Type: Double Beam

Photomultiplier Type: Normal(900nm)

D2 BG Correction Fitted: True

PWB Version: 45

Boot Block Version: 1.09

EEPROM Data:

Instrument Run Hours: 62809.832

D2 Run Hours: 49136.000

Zero Wavelength Offset: 30.148

D2 Serial Number: not set 1

Mono Correction: 0.785

D2 Install Date: 1/1/1970

Flame Hours: 29802.416

D2 Original Intensity: 1.000

D2 Last Intensity: 475.000

Frequency:

Averaging Period: 30.0

Datapoint Count: 20

Upper Limit: 61.00

Average Frequency: 60.00

Lower Limit: 49.00

Highest Measured Frequency: 60.00

Lowest Measured Frequency: 50.00

Result: Passed

Power Supply:

Averaging Period: 30.0

Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.19	13.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.80	Passed
5.00 V Rail	4.50	5.05	5.50	Passed
310.00 V Rail	279.00	320.00	341.00	Passed

Report Generated At: 1/24/2024 10:11:18 AM

2

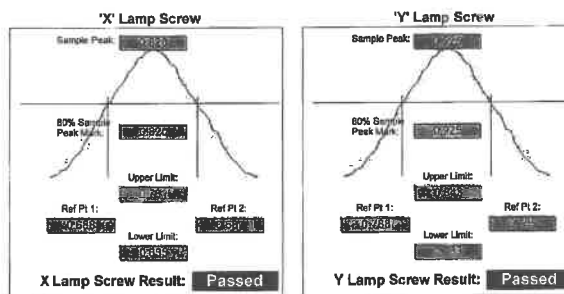
SVD Results Report
เอกสารไม่ควบคุม

Optics

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3

Peak Selected: 324.80
Lamp Alignment: Performed



Grating Squareness:

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: Performed

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.76	325.15	Passed
Second Order	649.23	649.52	649.97	Passed

Report Generated At: 1/24/2024 10:11:18 AM

3

SVD Results Report
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Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.750
Connected to Socket: 3
Lamp Current(mA): 4
Slit Width(nm): 0.2
Slit Height: Normal
Lamp Alignment: Performed

Lower Limit(nm)	324.768	324.888	Upper Limit(nm)
(Approach from Zero Order)		(Approach from end)	
Sample 1: 324.828		Sample 2: 324.828	
Sample 3: 324.828		Sample 4: 324.823	
Sample 5: 324.823		Sample 6: 324.823	
Sample 7: 324.823		Sample 8: 324.823	
Sample 9: 324.823		Sample 10: 324.823	

Mean: 324.825
Standard Deviation: 0.002

Result: Passed

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4

SVD Results Report
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Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	261	297	Passed
S1	156	165	191	Passed
S2	271	296	332	Passed
S3	474	507	579	Passed
S4	825	918	1006	Passed
S5	1435	1628	1764	Passed
S6	2498	2769	3053	Passed
S7	4347	4762	5313	Passed

Interlocks:

Burner Fitted: Working
N2O Burner Fitted: Untested
Flame Shield Closed: Working
Gas Control Fitted: Untested
Pressure Release Bung Fitted: Working
Liquid Trap Fitted: Working
Flame Detect: Working
GCU Active: Working
Oxidant Pressure: Working
Oxidant Changeover: Untested
Ignition: Working

Report Generated At: 1/24/2024 10:11:18 AM

5

SVD Results Report
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Auto Lamp Recognition:

Lamp 1: Uncoded Lamp/Not Connected
Lamp 2: 87 - Silver/Cadmium/Lead/Zinc(UltrAA) (Ag/C
Lamp 3: 14 - Copper (Cu)
Lamp 4: Uncoded Lamp/Not Connected
Lamp 5: Not Supported
Lamp 6: Not Supported
Lamp 7: Not Supported
Lamp 8: Not Supported

Result: **Passed**

GTA Temperature Monitoring:

Not Performed

Notes:

PM 24 Jan 2024

Signatures:

David 24/1/24
Date Date
Worawit T.
Date

Report Generated At: 1/24/2024 10:11:18 AM

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SVD Results Report

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Sequential by time report

1/24/2024 11:46 AM
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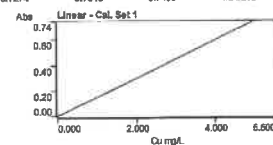
SpectrAA

Analyst
Date Started 1/24/2024 11:39 AM GMT: 1/24/2024 4:39 AM
Worksheet Cu 5 PPM Sense check
Comment
Method Cu
Computer name DESKTOP-RJLUPRS
Serial Number MY13190001

Method: Cu (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
CAL ZERO	0.000	55.0	0.0003
Readings	0.0002	0.0002	0.0004
			1/24/2024

STANDARD 1	5.000	1.7	0.7419
Readings	0.7274	0.7515	0.7468
			1/24/2024



Curve Fit = Linear
Characteristic Conc = 0.028 mg/L
r = 1.0000
Calculated Conc = 0.000 5.000
Residuals = 0.000 0.000

Abs = 0.14833 x C + 0.00025

Sample 001	4.886	0.7	0.7401
Readings	0.7454	0.7399	0.7348
			1/24/2024

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Sequential by time report

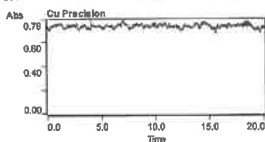
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SpectrAA

Analyst
Date Started 1/24/2024 11:47 AM GMT: 1/24/2024 4:47 AM
Worksheet Cu 5 PPM Precision
Comment
Method Cu
Computer name DESKTOP-RJLUPRS
Serial Number MY13160001

Method: Cu (Flame)

Sample ID	Exp Abs	%RSD	Mean Abs
Cu Precision	0.723	0.6	0.7232
Readings	0.7221	0.7195	0.7228
	0.7201	0.7213	0.7288
			0.7174
			1/24/2024



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UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 17780278

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : 09 July 2024

PM by : Pradit mayong
(Pradit M.)

Approved by : Kitchai S.
(Kitchai S.)



Coax Group Corporation Ltd.
1131/62,64,325-331 Nakornchaisri road,
Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand
Tel. 02-2435263, 02-6682436 Fax. 02-2437386

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Inspection result

ITEM	STANDARD	RESULT	JUDGE
1. Self Check			
1.1 Heating		PASS	OK
1.2 Cooling		PASS	OK
1.3 Leak		PASS	OK
1.4 Optical system		PASS	OK
1.5 Drift		PASS	OK
2. Analytical curve Inspection(AREA)			
2.1 No Pretreatment (Low Conc.)	Correlation coefficient (r) ≥ 0.9990	0.9999	OK
3. Repeatability(AREA)			
3.1 No Pretreatment 100ppb, n=3		1. 99.60 ppb 2. 101.84 ppb 3. 101.22 ppb C.V. ≤ 5% 1.15%	OK
4. Blank	Below 1.0 (AREA)	0.1002	OK

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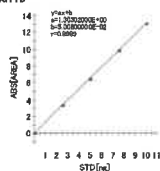
Counter

Maintenance	30MHz	3C	Scaviter	Parameter	
Measurement Counter	202312 09:40	Clear			
Mercury Exhaust Filter Alarm(1500mg)	1012 09:40	Clear			
Lamp Active Time(5000h)	1013mg(4 07:40)	Clear			
Membrane Filter Usage Time(2500h)	0908mg(4 07:40)	Clear			
Main Pump Lub(750h)	0908mg(4 07:40)	Clear			
Pressure Pump Time	302313mg(12 09:40)	Clear			
P1 Sub(1000mg)	0-400mg(4 07:40)	Clear			
P2 Sub(1000mg)	0-400mg(4 07:40)	Clear			
P3 Sub(1000mg)	0-400mg(4 07:40)	Clear			
P4 Sub(1000mg)	0-400mg(4 07:40)	Clear			
P5 Sub(1000mg)	0-400mg(4 07:40)	Clear			
P6 Sub(1000mg)	0-400mg(4 07:40)	Clear			
P7 Sub(1000mg)	0-400mg(4 07:40)	Clear			

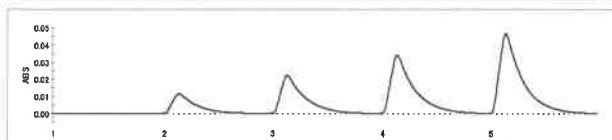
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Title : Preventive Maintenance RA-4500 sn:17780278
Date : 2024-07-09
Name : Coax Group
Memo : Calibration Curve 0-10ng

Galib



No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Note
1	100.000	0.000	5.000	5.000	0.000	0.0846	0.0265	-	
2	100.000	0.025	5.000	5.000	2.500	3.3464	2.5298	1.2	
3	100.000	0.050	5.000	5.000	5.000	6.4170	4.8863	2.3	
4	100.000	0.075	5.000	5.000	7.500	9.8647	7.5322	0.4	
5	100.000	0.100	5.000	5.000	10.000	13.1132	10.0253	0.3	



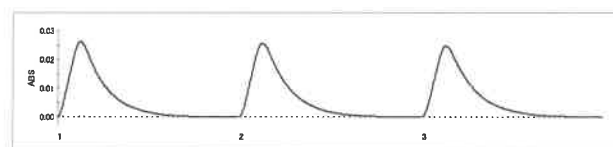
No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
1	100ppb	0.050	5.000	5.000	6.5389	4.9798	99.60	
2	100ppb	0.050	5.000	5.000	6.6948	5.0918	101.84	
3	100ppb	0.050	5.000	5.000	6.6446	5.0610	101.22	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	100ppb	3	100.887	1.15660	1.15

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NIPPON INSTRUMENTS CORPORATION



Self Check

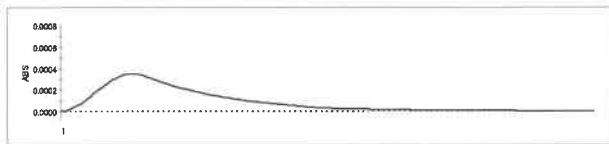
Heat check: PASS!! (26.3degC[05:00] -> 30.3degC[02:29])
Sensor check: PASS!! (50 - 10 = 40)
Leak check: PASS!! (0.1g/min)
Sig/Ref check: PASS!! (Sig: 4.00V, Ref: 4.02V)
Drift check: PASS!! (0.0000061 - -0.0000179 = 0.0000240)

-2-

เอกสารไม่ควบคุม
NIPPON INSTRUMENTS CORPORATION

Title : Preventive Maintenance RA-4500 sn:17780278
Date : 2024-07-09
Name : Coax Group
Memo : Blank

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [mg]	CONC [ug/L]	Note
1	Blank DI				0.1002	0.0385		



~>

เอกสารไม่ควบคุม

NIS NIPPON INSTRUMENTS CORPORATION

Technology



Service Report

TO	FOR
Company: United Analyst and Engineering Consultant Co., Ltd. , Bangkok-HQ Address: 700/2 หมู่ที่ 1 Phrakhanong District, Bangkok, 10260	Work Order Number: WO-00018067 Contact: Kamphong Boonpuang Email: kamphong.b@uaeconsultant.co.th Tel: +66 2763 2828 (7021), +66 8 6347 7390

WORK ORDER INFORMATION			
Top-Level		Order Type	Preventive Maintenance
Installed Product ID	IB-00105024	Billing Type	Paid
Product	SKALAR SAN++ Classic 2SAN59000	PO No.	SSPR2400629
Serial No.	182688	Warranty No.	
		Contract No.	

PRODUCTS SERVICED		
Installed Product Id	Serial Number	Product

PROBLEM DESCRIPTION						
PM 1/1						

Line Number	Engineer	Start Date And Time	End Date And Time	Billable Labor Hour	Billable Travel Hour	Travel KM
WL-00071161	Yongyuth Chanphong	02/20/2024 8:53 AM	02/20/2024 6:07 PM	9.23333		
WL-00092966	Ronnarit Dechnawarat	02/20/2024 8:53 AM	02/20/2024 6:07 PM	9.23333		
Total				18.46666	0	0

Reach us at DKSH Service-Hotline : +66 2 639 7000
2533 Sukhumvit Road, Bangkok, 10260, Phrakhanong, Bangkok, Thailand
Phone +66 2 639 7000 Fax +66 2 333 1029

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Technology



Line Number	Work Description
WL-00071161	ทำ PM เซ็นเซอร์
WL-00092966	ทำ PM เซ็นเซอร์

PARTS CONSUMED		
Part No	Part Description	Quantity

EXPENSES			
Part No	Expense Type	Description	Line Quantity

RECOMMENDED PARTS	
แบตเตอรี่ไฟฟ้ที่ต่อมึงซื้อเพิ่มคันนี้คิงนี้ , อะไหล่ พารามิเตอร์ Ammonia จำนวน 2 รายการ (9220, 3026) , อะไหล่ พารามิเตอร์ Phenol และ Cyanide จำนวน 6 รายการ (5454, 3028, 3031, 3034, 3036, 3150)	

REMARKS

Travel Time Disclaimer:
Please note that the travel time in this report only includes time taken to reach the installed equipment location. It does not include our engineer's return travel time.

Customer Signature:

Kamphong b

Customer Signature

Date: 04/10/2024

Technician: Yongyuth Chanphong
Job Title: Service Manager
Email: yongyuth.yc@dksh.com

Reach us at DKSH Service-Hotline : +66 2 639 7000
2533 Sukhumvit Road, Bangkok, 10260, Phrakhanong, Bangkok, Thailand
Phone +66 2 639 7000 Fax +66 2 333 1029

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Technology



Job No. WO-00018067

Test Report

Customers			
United Analyst and Engineering Consultant Co., Ltd.			
Equipment	Continuous Flow Analyzer	Manufacturer	SKALAR
Controller Model	SA5000	Auto Sample Model	SA1052
Controller Serial No.	182688	Auto Sample Serial No.	181729
Date of test	20-Feb-2024	Period	12 Month
Environment temperature	24.7 °C	Humidity	62.2 %RH

Instrument Checked					
Results					
Item	Characteristic	Before	After	Remark	
1	Visual Inspect	Pass	Fail	Pass	Fail
2	Power supply (210-240 VAC)	220 VAC	220 VAC		
3	Computer	Pass	Fail	Pass	Fail
4	Program	Pass	Fail	Pass	Fail
5	Auto sampler	Pass	Fail	Pass	Fail
6	Module holder	Pass	Fail	Pass	Fail
	- Motor pump	Pass	Fail	Pass	Fail
	- Pump tube	Pass	Fail	Pass	Fail
	- Air-injection	Pass	Fail	Pass	Fail
	- Chemistry manifolds, Switching valve, Coil, Membrane	Pass	Fail	Pass	Fail
7	Detector	Pass	Fail	Pass	Fail
	- Filter	Pass	Fail	Pass	Fail
	- Flow cell	Pass	Fail	Pass	Fail
	- Lamp	Pass	Fail	Pass	Fail
8	Interface	Pass	Fail	Pass	Fail
9	Rinsing valves	Pass	Fail	N/A	Pass
10	Temperature / Reactor	Pass	Fail	N/A	Pass
11	Flame photometer	Pass	Fail	N/A	Pass
12	UPS / Stabilizer	Pass	Fail	N/A	Pass

Warning and Error Checked			
Item	Event	Before	After
13	Error list	None Appear : _____	None Appear : _____

DKSH Technology Limited (head office)
2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok, 10260
Phone +66 2 639 7000, Mobile +66 93 823 8881, yongyuth.yc@dksh.com, www.dksh.com

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Check with Standard

Item	Characteristic	Before	After	Remark
14	Base Line Test	Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A <input type="checkbox"/>	
15	Detector Signal Test	Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A <input type="checkbox"/>	

Summary of checked

- ☐ The instrument can work normally and efficiently. (เครื่องมือสามารถทำงานได้ปกติและไม่มีประสิทธิภาพ)
- ☐ The instrument can work but it's requiring to maintenance. (เครื่องมือสามารถทำงานได้แต่ต้องบำรุงรักษา)
- ☐ The instrument could not work it's requiring to repair. (เครื่องมือไม่สามารถทำงานได้และต้องการซ่อมบำรุง)

Remark :

- * Pump tube และ Air tube เป็นไปตามข้อกำหนดและไม่ได้เปลี่ยนตามรายการข้างต้น
- ** อะไหล่ 9220 (Manifold T-Sist needle) เข้าชุดไม่สามารถใช้งานได้ และได้เปลี่ยนมาใช้ 5216 ทดแทนที่คร่าว
- *** อะไหล่ 5454 (Nipple polyethylene NS) เป็น ใช้ทำการเปลี่ยนใหม่แล้ว

หมายเหตุ และอะไหล่ที่ควรต้องเปลี่ยนคือ :

1. อะไหล่ ทารานีแคด Ammonia จำนวน 2 รายการ (9220, 3026)
2. อะไหล่ ทารานีแคด Phenol และ Cyanide จำนวน 6 รายการ (5454, 3028, 3031, 3034, 3036, 3150)

Standard Equipment Used

Equipment	Equipment I.D.
Digital multi meter	S/N 57600592 Due date : 8-Jul-2024
Thermo hygrometer	S/N 39520444 Due date : 27-Dec-2024

Test By : 
(Mr. Yongyuth Charnphong)Approved by : 
(Mr. Eknapong Wankiang)

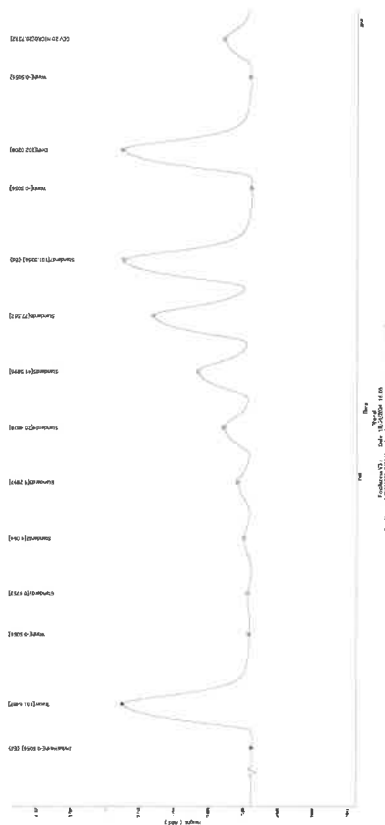
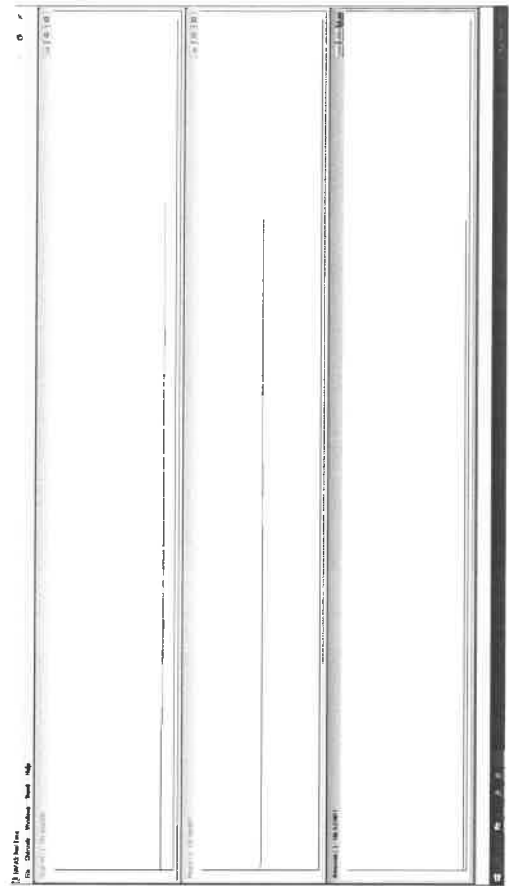
Position : Supervisor, Technical Service

Position : Manager, Technical Services

DKSH Technology Limited (Head office)
2553 Sukhumvit Road, Bangkok, Phrasabang, Bangkok, 10260
Phone +66 2 639 7000, Mobile +66 93 813 8683, yongyuth.yo@dksh.com, www.dksh.com

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REPORT OF CALIBRATION

Certificate No. : SP24-001

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Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000 0.7469	0.000 0.743	0.0000 0.0039	0.0050 0.0057	2.00 2.00
257	0.0000 0.8674	0.000 0.862	0.0000 0.0054	0.0050 0.0059	2.00 2.00
313	0.0000 0.2919	0.000 0.289	0.0000 0.0029	0.0050 0.0051	2.00 2.00
350	0.0000 0.6430	0.000 0.641	0.0000 0.0020	0.0050 0.0055	2.00 2.00

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PM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP24-001

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.2	0.52	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.4	0.41	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.4	0.19	0.18	2.00
445.94	445.8	0.14	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.4	0.19	0.18	2.00
637.98	638.0	-0.02	0.18	2.00
431.38	431.2	0.18	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.4	-0.23	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	684.4	0.00	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.1	-0.07	0.18	2.00
879.28	879.5	-0.22	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

- * Indicates ISO 17025 accredited

- End of Certificate -

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PM-708-02 R01 1/11/2021



PinAAcle 900F Preventive Maintenance Report

Company Name: UAE Consultant Co., LTD.

Instrument Location: 41 Sukumvit Rd.,

Phra Khanong, Bangkok 10260

Instrument Serial No.: PFB520031902

Date: 14-May-2024

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PinAAcle 900F Preventive Maintenance (PM)

Company Name:	United Analyst and Engineering Consultant Co., LTD.		
Address (Instrument Location):	41 Sukumvit Rd., Phra Khanong, Bangkok 10260		
Serial Number:	PFB520031902	PM Number:	2 of 2
Customer Name (if applicable):	K. Yinda	Telephone Number:	095-5560049
Customer Support Engineer Name:	K. Chayanon	Service Order Number:	WO-02787590
Date PM Performed: (DD-MM-YYYY)	14-May-2024	Next PM Due Date: (DD-MM-YYYY)	14-Nov-2024
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date
09370145 Rev.9	A	January 2018



Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.
The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
PinAAcle900F	PFBS20031902	Syngistix V 4.0.1.1935
Flas100(New Install)	100524040501	

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
80501696	Fan Filters	N/A
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	N/A
N9301714	Replacement Acetylene Filter Cartridge	N/A
TH001022	Replacement Air Filter Cartridge	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (mm/yy)
N9300183	1000 mg/L Copper Standard	AR	27-39CUY1	Apr 2025

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (mm/yy)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO ₃	250 ml.	AR	AR

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Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	101N0089015
N1013002	1.0A Neutral density filter	1	101N0089015
0303097	System 2 EDL Driver	1	0303097
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	060419-030180
N3050109	Sa Lumina HCL	1	061219-020041
N3050139	K Lumina HCL	1	030819-010130
N3050152	Ni Lumina HCL	1	052719-020020

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Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the Instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary.
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking slot width. Replace if out of specification.
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary).
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

6. Gasses:

- ☒ Verify that the Gasses supplied to the Instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-Installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

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7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	±5% from Cert.	0.9995	1.0143	Passed
0.2 A ND Filter	±5% from Cert.	0.1936	0.1966	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.002	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

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8.4 D₂ Background Compensation with Copper

Description: Verifies the instrument's ability to compensate for background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0001	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.002	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0022	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.350 Abs.	0.8005	Passed

10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

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Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F ☒ Passes ☐ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

Date:
14-May-2024
(DD-MMM-YYYY)

Authorized Customer Representative:

Date:
14-May-2024
(DD-MMM-YYYY)

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2715-3484



Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.195/2561(ENV.pH.0461)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-0882WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH6 by comparison with temperature standard

Calibrated by : Warakorn Lerngagtrakul

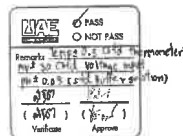
Approved by : _____
Approved Signatory

() Unnopphol Harachai
() Porpan Palpim
(✓) Sailhip Meangmai

Issue Date : 29 August 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.





Cert.No.: 24CH1070
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160056	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2160600	130RC044	231218	10 Oct 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

: The measurement results are traceable to SI through Hach Lange GmbH LI Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value		Standard Voltage Input		Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH	mV	pH		
pH Meter S/N.: JC02729	4.00	177.48	177	4.01	0.58	2.00	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		



Cert.No.: 24CH1070
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 231018SIAB05377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe,

- Model :	
- Serial No. :	231018SIAB05377
- Dimension of probe	
- Length :	110 mm.
- Diameter :	12 mm
- Immersion Depth :	100 mm.

Calibration Point ($^{\circ}$ C)	Standard Temperature ($^{\circ}$ C)	UUC* Reading ($^{\circ}$ C)	Error ($^{\circ}$ C)	Uncertainty of measurement (\pm $^{\circ}$ C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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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TEL.0-2717-3000-29 FAX.0-2719-5484



Certificate of Calibration

Cert. No.: 24TM647
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E6
Serial No. : 2020000015535
ID No. : UAE.MIC.018/2584
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (28 ± 10) $^{\circ}$ C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattansongpaiboon
Approved by :
() Ponpan Paipim
() Suwit Imjai
() Kunchit Promprut
Issue Date : 7 April 2024

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 : 2404-0003OC-8
Procedure Used : Calibration was conducted using calibration procedure CP-0702 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Cert. No.: 24TM647
Page : 2 of 3

Condition of this result of calibration

1. Reference standard instrument:-

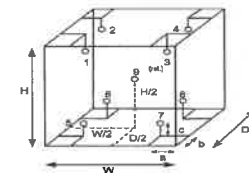
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	23LM122	TPA	28 Jul 2024

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.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source
Fresh air setting : Close



Probe Installation Details :
a = 10 cm
b = 10 cm
c = 10 cm
Dimension of Chamber :
D = 0.48 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³

Environment during calibration		
	Beginning	Finished
Temp. ($^{\circ}$ C)	24	24
REL.Humid. (%)	54	57
AC Supply (Volt)	221	223

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	20-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-6
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM647
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	0.30

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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ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsak 41, Sukhumvit Road,
Bangchack, Prekhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

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



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ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Date of Calibration: 2 April 2024

Environment Condition: Ambient Temperature: 24.5 °C Relative Humidity: 47.5 % ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class F2	1mg to 200g	8505567572	TCS	H239-0535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo Hygro Meter	608 H1	NFI 6TH C16/23	Quakey Reborn	QR74-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

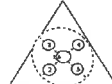
1. Repeatability of Readings:

Nominal Value	Standard Deviation of Reading
40	0.0000052
80	0.0000063
100	0.000018
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

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



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.000000	0.00000	0.00000	0.0000088	2.00
0.001	0.001000	0.00101	-0.00001	0.0000091	2.00
0.005	0.005000	0.00499	0.00001	0.0000094	2.00
0.01	0.010000	0.01000	0.00000	0.0000091	2.00
0.05	0.049995	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000003	1.00002	-0.00002	0.000016	2.00
2	2.000073	2.00001	0.00006	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000003	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00002	0.00001	0.000037	2.00
30	30.000040	30.00003	0.00001	0.000052	2.00
50	50.000028	50.00004	-0.00001	0.000068	2.00
80	80.000068	80.00003	0.00003	0.00011	2.00

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: JSR2050U
Resolution: 0.0001 g / 0.0001 g
Serial No.: C09071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustments: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
90	90.00016	90.0000	0.0001	0.00015	2.00
100	100.00006	100.0000	0.0001	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0000	0.0001	0.00018	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0000	0.0002	0.00028	2.00

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

----- End -----

FCS-012 Revision: 01 Date: 20-04-65

Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the installation.

Note: While non-current production AA instrument and/or accessory models are not covered specifically in this document it can be used as a basic reference.

For more information about Agilent Technologies services please visit our web site using the following URL: <http://www.agilent.com/en-us/services>

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

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Instrument Preventive Maintenance Checklist

Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>
- Need technical support, FAQs, supplies? - visit our Support Home page at <http://www.agilent.com/search/support>
- Get answers. Share insights. Build connections. Join the Agilent Community at <https://community.agilent.com/welcome>

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice.

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Instrument Preventive Maintenance Checklist

Instrument Maintenance

System Information

☐ Check this box if an instrument configuration record is attached instead of completing the table

Instrument System Name and ID

Instrument System Site and Location UNITED ANALYST AND ENGINEERING CONSULTANT / 2nd Lab

List System Component Product Numbers

- G 8432 A
-
-
-
-
-
-
-
-

List the Serial Numbers of each Component

47 016 0001

Preparation, Safe operation and initial performance checks

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Preventive Maintenance Procedures

FLAME SYSTEM section

☐ Section not applicable

Electronic components

- ☒ Review and confirm instrument configuration data in SVD
- ☒ Confirm power supply voltages using the **SVD Power Supply diagnostic**.
- ☒ For Dual Beam instruments - Confirm RBC frequency using the **SVD RBC frequency diagnostic**.

Mechanical components

- ☒ Check the burner adjuster controls for complete and free movement, if the burner adjuster needs lubrication, use Molykote 571 or lithium-based molybdenum disulphide grease
- ☒ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☒ Monochromator drive
 - ☒ Slit drive
 - ☒ Lamp selector
 - ☒ ABA N/A

Optics components

- ☒ Check that external optical surfaces are clean – Clean or replace as required.
- ☒ Use SVD and perform **Mono Wavelength Correction**.
- ☒ Use SVD and perform **Slit Calibration**.
- ☒ Use SVD and perform **Grating Squariness Diagnostic**.
- ☒ Use SVD and perform **Zero Order Offset/Mono Correction**.
- ☒ Use SVD and perform **Wavelength Repeatability**.
- ☒ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age
- ☒ Check that the signal energy of the D2 and Hg lamps track properly. Advise customer if their D2 lamp is showing emission degradation due to age.

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Sample Introduction and Atomization

- ☒ Inspect the burner interlock plate to ensure that the interlock pin is secure and correct for the burner type.
- ☒ Clean the burner slot with a clean white card.
- ☒ Check the uniformity of the slot width.
- ☒ Clean the burner if required.
- ☒ Change the burner o-ring.
- ☒ Clean the nebulizer, spray chamber and liquid trap.
- ☒ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ☒ Check that the pressure relief bung releases readily.
- ☒ Change o-rings on the fuel and oxidant delivery bars.
- ☒ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ☒ Refill liquid trap and check that overflow drains freely into the drain/waste tube.
- ☒ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
- ☒ Check and clean the igniter electrode

Gas handling components and safety interlocks

- ☒ Pressure test for leaks
- ☒ Leak test gasbox internal components and connections
- ☒ Check safety interlock status and operation using the **SVD interlock monitoring diagnostic**.

Analytical performance for Flame systems

- ☒ Ignite a flame.
- ☒ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
- ☒ Optimize the instrument ready to perform Cu sensitivity test.
- ☒ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing"
- ☒ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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FURNACE SYSTEM section

☒ Section not applicable

Electronic components

- ☐ Review and confirm instrument configuration data in SVD
- ☐ Confirm power supply voltages using the **SVD Power Supply diagnostic**.

Mechanical components

- ☐ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☐ Monochromator drive
 - ☐ Slit drive
 - ☐ Lamp selector

Optics components

- ☐ Check that external optical surfaces are clean – Clean or replace as required.
- ☐ Use SVD and perform **Mono Wavelength Correction**.
- ☐ Use SVD and perform **Slit Calibration**.
- ☐ Use SVD and perform **Grating Squariness Diagnostic**.
- ☐ Use SVD and perform **Zero Order Offset/Mono Correction**.
- ☐ Use SVD and perform **Wavelength Repeatability**.
- ☐ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.

Gas handling, water system and workhead component checks

- ☐ Inspect the GTA workhead gas hoses and connections for leaks.
- ☐ Pressure test for gas leaks
- ☐ If the cooler system is accessible (stand-alone) check for correct operation and coolant/water level – this includes any temperature and pressure settings plus filter cleaning (air flow and water).
- ☐ Inspect the GTA workhead water hoses and connections for leaks.
- ☐ Check all graphite components and replace if necessary.

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- ☐ Tube
- ☐ Electrodes
- ☐ Shroud

- ☐ Check and clean the end windows on the workhead.
- ☐ Check safety interlock operation.

Analytical performance for Furnace systems

- ☐ Optimize the instrument ready to perform Cu sensitivity test.
- ☐ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

- ☒ Section NOT Applicable
- ☐ Check condition of the PSD capillary – replace if necessary
- ☐ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ☐ Change PSD rinse bottle o-ring.
- ☐ Check and clean the rinse vessel.
- ☐ Check the drain tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel.
- ☐ Ensure that the waste vessel is suitable for use with the furnace system.

Sample introduction pump system (SIPS) accessory

- ☒ Section NOT Applicable
- ☐ Re-torque screws securing the hubs, presser arms and pump rotors
- ☐ Adjust each roller so that it rotates freely.
- ☐ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth
- ☐ Ensure that the presser arms and the surfaces near the pump are free from dirt and spills.
- ☐ Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion.
- ☐ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ☐ Check clips securing the diluents holder and replace if necessary.
- ☐ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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- ☐ Remove the T-piece by disconnecting the pump tubes, the pump bands and all other tubing.
- ☐ Place the T-piece in an ultrasonic bath containing strong detergent 1-5% Decon 30 or similar, for approximately 5-10 minutes.
- ☐ Wash the T-piece under a tap with a strong flow of water.
- ☐ Rinse with distilled water through all of the inlets in the reverse direction to normal sample flow.
- ☐ Reassemble.

Sample preparation system (SPS 4) accessory

☒ Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler.

- ☐ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent.
- ☐ Cleaning the autosampler cover panels with domestic window cleaner.
- ☐ Checking the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.

For further details refer to the SPS 4 service manual G8410-90050.

Sample preparation system (SPS 3) accessory

☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions - adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 ml. of Dow Corning 200 0 Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions - Calibrate if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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Vapor generation accessory VGA (hydride generator)

☒ Section NOT Applicable

- ☐ Inspect VGA gas supply hose.
- ☐ Inspect/replace VGA pump tubing.
- ☐ Check low gas pressure interlock setting – adjust if required.
- ☐ Check precision orifice gas flow setting – adjust if required.
- ☐ Check gas regulator pressure to 46 psi (325 kPa) – adjust if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

UltraAA lamp accessory (external)

☒ Section NOT Applicable

- ☐ Check the condition of the power cable
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

- ☒ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method).

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

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Signature Page

Service Review

- ☒ A tech advisor reports (prioritize) all faults to this document.
- ☒ Record the Preventive Maintenance service activity in the customer's recordkeeping book.
- ☒ Use agreed instrument maintenance counters as appropriate.
- ☒ Affix this PM sticker to the system or instrument logbook, based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this report, print, explain, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.

Test Results

Test Description		
Flame optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	44 %
Flame performance test with 5 ppm copper sample		
Air/acetylene, mixing paddle removed	Abs value > 0.5	0.7401 A
Air/acetylene, mixing paddle installed, 10 replicates	%RSD < 1.0	0.5 % RSD
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	N/A
Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.15	N/A
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.10	N/A
MSPL	≥ 70 %	N/A

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เอกสารไม่ควบคุม

AA consumable and parts list table

Part Description	Product/Model # where used	PM supplied or Consumable	Instrument-Type
Test Solution – Cu 5ppm solution	6610030100	50 55 140 240 280	PM supplied Common
Test Solution - Blank solution	5156-7001	50 55 140 240 280	PM supplied Common
Copper, 1000 ug/ml, 100ml	5190-4279	50 55 140 240 280	PM supplied Common
Kil, Mk 7 O-rings, aqueous, complete set	5910093400	50 55 140 240 280	PM supplied Flame
Organic Kit	9910093500	50 55 140 240 280	PM supplied Flame
Wise Nebulizer Cleaning	9910024700	50 55 140 240 280	consumable Flame
Tubing-Capillary Std Nebs	9910024800	50 55 140 240 280	consumable Flame
Capillary Tube Hvac Neb (3) (organics only)	9910044000	50 55 140 240 280	consumable Flame
Glass Impact Leads (5/pk)	9910025700	50 55 140 240 280	consumable Flame
Teflon impact beads (5 pk) (organics only)	9910053300	50 55 140 240 280	consumable Flame
Burner cleaning strip (100-pk)	9910053900	50 55 140 240 280	consumable Flame
Window UV silica – round (right side)	2010082600	50 55 140 240 280	PM supplied Common
Window UV silica – rectangular (left side)	2010082500	50 55 140 240 280	PM supplied Common
Pad adhesive window (round)	4910012700	50 55 140 240 280	PM supplied Common
Pad adhesive window (rectangular)	4910012300	50 55 140 240 280	PM supplied Common
Electrode kit (1 pr) (D2)	6310003400	GTA120	PM supplied Furnace
Shroud (D2)	6310003100	GTA120	PM supplied Furnace
Zeeman electrode kit (1 pr)	6310003500	GTA120	PM supplied Furnace
Zeeman shroud	6310003600	GTA120	PM supplied Furnace
O-ring PSD rinse bottle	6910025900	PBD120	PM supplied Furnace

* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM

Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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Service Engineer Comments (optional)

Service Completion

Service request number 6506371115

Date service completed 24 January 2024

Agilent signature Worawit T.

Customer signature Jiradee

Total number of pages in this document 13

Agilent
CrossLabAgilent
เอกสารไม่ควบคุม

SVD Results Report

Customer: Service Engineer: Worawit T.
Address: Contact Details:

Instrument Configuration

Configuration:

Serial Number: MY13160001 Turret Type: Automatic
Instrument Model: Varian AA140/240/260 Number Of Lamps: 4
Flame Instrument: True Mono Type: Automatic
Furnace Instrument: True Gasbox Type: Y Gas Box
Zeeman Present: False Auto Bumer Adjuster: False
Internal Zeeman: False Mains Frequency: 50
Internal UltraAA: False Firmware Version: 2.11
Optics Type: Double Beam Photomultiplier Type: Normal(900nm)
D2 BG Correction Fitted: True PWB Version: 45
Boot Block Version: 1.09

EEPROM Data:

Instrument Run Hours: 62609.832 D2 Run Hours: 49138.000
Zero Wavelength Offset: 30.148 D2 Serial Number: not set 1
Mono Correction: 0.765 D2 Install Date: 1/1/1970
Flame Hours: 29802.416 D2 Original Intensity: 1.000
D2 Last Intensity: 475.000

Frequency:

Averaging Period: 30.0
Datapoint Count: 20

Upper Limit: 51.00 Highest Measured Frequency: 50.00
Average Frequency: 50.80
Lower Limit: 49.00 Lowest Measured Frequency: 50.00

Result: Passed

Report Generated At: 1/24/2024 10:11:18 AM

1

SVD Results Report SVD

เอกสารไม่ควบคุม

Power Supply:

Averaging Period: 30.0
Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00V Rail	10.80	12.19	13.20	Passed
-12.00V Rail	-13.20	-11.90	-10.80	Passed
5.00V Rail	4.50	5.05	5.50	Passed
310.00V Rail	278.00	320.00	341.00	Passed

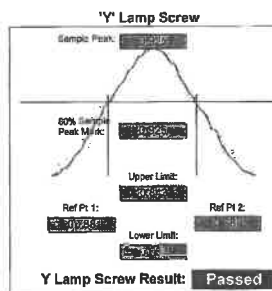
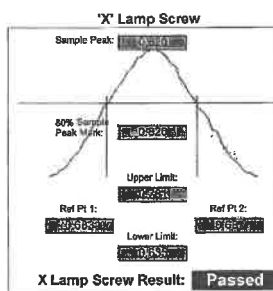
Report Generated At: 1/24/2024 10:11:18 AM

2

SVD Results Report SVD
เอกสารไม่ควบคุม

Optics

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3Peak Selected: 324.80
Lamp Alignment: Performed

Grating Squareness:

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: Performed

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.76	325.15	Passed
Second Order	648.23	648.62	649.37	Passed

Report Generated At: 1/24/2024 10:11:18 AM

3

SVD Results Report SVD
เอกสารไม่ควบคุม

Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.750
Connected to Socket: 3
Lamp Current(mA): 4
Slit Width(nm): 0.2
Slit Height: Normal

Lamp Alignment: **Passed**
Lower Limit(nm) 324.758 324.888 Upper Limit(nm)
(Approach from Zero Order) (Approach from end)
Sample 1: 324.828 Sample 2: 324.828
Sample 3: 324.828 Sample 4: 324.823
Sample 5: 324.823 Sample 6: 324.823
Sample 7: 324.823 Sample 8: 324.823
Sample 9: 324.823 Sample 10: 324.823
Mean: 324.825 Standard Deviation: 0.002

Result: **Passed**

Report Generated At: 1/24/2024 10:11:18 AM

4

SVD Results Report
เอกสารไม่ควบคุม

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	261	297	Passed
S1	158	165	191	Passed
S2	271	298	332	Passed
S3	474	507	579	Passed
S4	825	918	1008	Passed
S5	1435	1628	1754	Passed
S6	2498	2769	3053	Passed
S7	4347	4752	5313	Passed

Interlocks:

Burner Fitted: **Working** Flame Detect: **Working**
N2O Burner Fitted: **Untested** GCU Active: **Working**
Flame Shield Closed: **Working** Oxidant Pressure: **Working**
Gas Control Fitted: **Untested** Oxidant Changeover: **Untested**
Pressure Release Bung Fitted: **Working** Ignition: **Working**
Liquid Trap Fitted: **Working**

Report Generated At: 1/24/2024 10:11:18 AM

5

SVD Results Report
เอกสารไม่ควบคุม

Auto Lamp Recognition:

Lamp 1: Uncoded Lamp/Not Connected Lamp 5: Not Supported
Lamp 2: 87 - Silver/Cadmium/Lead/Zinc(UltrAA) (Ag/C/Lamp 6: Not Supported
Lamp 3: 14 - Copper (Cu) Lamp 7: Not Supported
Lamp 4: Uncoded Lamp/Not Connected Lamp 8: Not Supported

Result: **Passed**

GTA Temperature Monitoring:

Not Performed

Notes:

PM 24 Jan 2024

Signatures:

David 24/1/24 Wormill T. 24/1/24
Date Date Date Date

Report Generated At: 1/24/2024 10:11:18 AM

6

SVD Results Report
เอกสารไม่ควบคุม

Sequential by time report

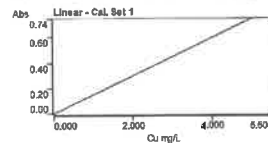
1/24/2024 11:46 AM
Page 1 of 1

SpectraAA

Analyst
Date Started 1/24/2024 11:39 AM GMT: 1/24/2024 4:39 AM
Worksheet Cu 5 PPM Sens check
Comment
Method Cu
Computer name DESKTOP-RGUMF7S
Serial Number MY13160001

Method: Cu (Flame)

Sample ID	Conc. mg/L	%RSD	Mean Abs
CAL 27440	0.000	55.0	0.0003
	Readings		
	0.0002	0.0002	0.0004
	1/24/2024		
STANDARD 1	5.000	1.7	0.7419
	Readings		
	0.7274	0.7515	0.7468
	1/24/2024		



Curve Fit = Linear
Characteristic Conc = 0.028 mg/L
r = 1.0000
Calculated Conc = 0.000 5.000
Residuals = 0.000 0.000

Abs = 0.14935 x C + 0.000293			
Sample 001	4.888	0.7	0.7401
	Readings		
	0.7464	0.7399	0.7349
	1/24/2024		

เอกสารไม่ควบคุม

Method: Cu (Flame)

เอกสารไม่ควบคุม

UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report


Serial No. : 17780278

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : 09 July 2024

PM by Pradit mayong
(Pradit M.)

Approved by : 
(Kitichai S.)



 **Coax Group Corporation Ltd.**
1131/62,64,325-331 Nakornchaisri road,
Kwang Thanon Nakornchaisri, Dusit, Bangkok 10300 Thailand
Tel. 02-2435263. 02-6682436 Fax. 02-2437386

เอกสารไม่ครบคณ

Inspection result

ITEM		STANDARD	RESULT	JUDGE
1. Self Check	1.1 Heating		PASS	OK
	1.2 Cooling		PASS	OK
	1.3 Leak		PASS	OK
	1.4 Optical system		PASS	OK
	1.5 Drift		PASS	OK

2. Analytical curve inspection (AREA)

2.1 No Pretreatment (Low Conc.)	Correlation coefficient	0.9999	OK
	(r) ≥ 0.9990		

3. Repeatability(AREA)

3.1	No Pretreatment	100ppb, n=3	1.	99.60	ppb
			2.	101.84	ppb
			3.	101.22	ppb
		C.V. ≤ 5%		1.15%	OK

4. Blank	Below 1.0 (AREA)	0.1002	OK
----------	------------------	--------	----

เอกสารไม่ควบคุม

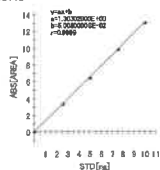
Counter

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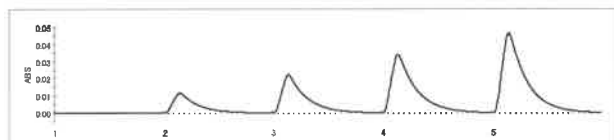
เอกสารไม่ควบคุม

Title : Preventive Maintenance RA-4500 sn:17780278
Date : 2024-07-08
Name : Coax Group
Memo : Calibration Curve 0-10ng

Calib



No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [CN]	MEAS [ng]	Dev [%]	Note
1	100.000	0.000	5.000	5.000	0.000	0.0846	0.0265	-	
2	100.000	0.025	5.000	5.000	2.500	3.3464	2.5298	1.2	
3	100.000	0.050	5.000	5.000	5.000	6.4170	4.8863	2.3	
4	100.000	0.075	5.000	5.000	7.500	9.8647	7.5322	0.4	
5	100.000	0.100	5.000	5.000	10.000	13.1132	10.0253	0.3	



No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [CN]	MEAS [ng]	CONC [ug/L]	Note
1	100ppb	0.050	5.000	5.000	6.5389	4.9798	99.60	
2	100ppb	0.050	5.000	5.000	6.6848	5.0918	101.84	
3	100ppb	0.050	5.000	5.000	6.6446	5.0610	101.22	

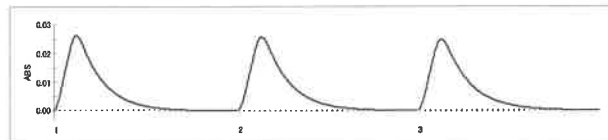
Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	200ppb	3	100.887	1.15660	1.15

-1-

เอกสารไม่ควบคุม

NIP NIPPON INSTRUMENTS CORPORATION



Self Check

Heat check: PASS!! (26.3degC[05:00] -> 30.3degC[02:29])
Sensor check: PASS!! (33-10= 43)
Leak check: PASS!! (0.19L/min)
Sig/Ref check: PASS!! (Sig: 4.00V, Ref: 4.02V)
Drift check: PASS!! (0.000061 - -0.0000179 = 0.0000240)

-2-

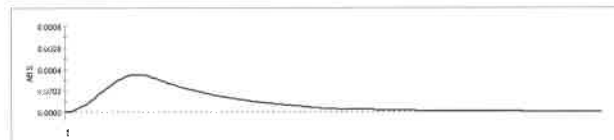
เอกสารไม่ควบคุม

NIP NIPPON INSTRUMENTS CORPORATION

Title : Preventive Maintenance RA-4500 sn:17780278
Date : 2024-07-09
Name : Coax Group
Memo : Blank

SNP

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [CN]	MEAS [ng]	CONC [ug/L]	Note
1	Blank DI				0.1002	0.0385		



-3-

เอกสารไม่ควบคุม

NIP NIPPON INSTRUMENTS CORPORATION

DQE Services Co., Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeserviceinfo@gmail.com



CERTIFICATE OF CALIBRATION

Certificate No. : SP24-001

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co., Ltd. (Head Office)

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

Location of calibration : Laboratory 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 4 January 2024

Calibration Date : 4 January 2024

Issue Date : 5 January 2024

Condition Instrument : Good

Calibrated by :
(Mr. Tanawat Rittidech)
Technical Manager

Approved by :
(Ms. Chonticha Sangnorn)
Quality Manager

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

This document is the property of the laboratory and its availability to participants is based on the accuracy of the measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

เอกสารไม่ควบคุม

PM-908-02 R01 1/11/201



REPORT OF CALIBRATION

Certificate No. : SP24-001

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP24-001

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.520	0.0030	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.516	0.0021	0.0031	2.00
	1.0002	0.997	0.0032	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.550	0.0017	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.558	0.0011	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

เอกสารไม่ควบคุม

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REPORT OF CALIBRATION

Certificate No. : SP24-001

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Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.743	0.0039	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.862	0.0054	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.289	0.0029	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.641	0.0020	0.0055	2.00

เอกสารไม่ควบคุม

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REPORT OF CALIBRATION

Certificate No. : SP24-001

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.2	0.52	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.4	0.41	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.4	0.19	0.18	2.00
445.94	445.8	0.14	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.4	0.19	0.18	2.00
637.98	638.0	-0.02	0.18	2.00
431.38	431.2	0.18	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.4	-0.23	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	684.4	0.00	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.1	-0.07	0.18	2.00
879.28	879.5	-0.22	0.18	2.00

Remark : - UUC = 1nm Under Calibration

- N/A = Not Available

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

- which for a normal distribution corresponds to a coverage probability of approximately 99%

- * Indicates non TISI accredited

- End of Certificate -

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

CERTIFICATE OF CALIBRATION

Certificate No. : SP24-008 Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phraekhanong, Bangkok 10260

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-1900

Serial No. : 2021-064



ID No. : UAE.WAS.006/2552

Received Date : 16 January 2024

Calibration Date : 16 January 2024

Issue Date : 19 January 2024

Condition Instrument : Good

Calibrated by :  Approved by : 
(Mr. Tanawat Rittidach) (Ms. Chonticha Sangsri)
Technical Manager Quality Manager

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

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

เอกสารไม่ควบคุม

FM-708-02 R01 1/1/2021

REPORT OF CALIBRATION

Certificate No. : SP24-008 Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/1/2021

REPORT OF CALIBRATION

Certificate No. : SP24-008 Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.046	0.0024	0.0029	2.00
	2.1876	2.186	0.0016	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0034	2.00
	1.0239	1.024	-0.0001	0.0035	2.00
	2.1230	2.121	0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.520	0.0030	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.516	0.0021	0.0031	2.00
	1.0002	0.999	0.0012	0.0033	2.00
	1.9973	1.994	0.0033	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.550	0.0017	0.0030	2.00
	1.0803	1.080	0.0003	0.0030	2.00
	2.0373	2.032	0.0053	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.558	0.0011	0.0031	2.00
	1.0518	1.051	0.0008	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

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FM-708-02 R01 1/1/2021

REPORT OF CALIBRATION

Certificate No. : SP24-008 Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.748	-0.0011	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.865	0.0024	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.293	-0.0011	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.641	0.0020	0.0055	2.00

เอกสารไม่ควบคุม


FM-708-02 R01 1/1/2021

DQE Services Co., Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



 ISO 9001:2015
 CALIBRATION

REPORT OF CALIBRATION

Certificate No. : SP24-008

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	LUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.54	241.1	0.44	0.18	2.00
279.40	278.9	0.50	0.18	2.00
288.70	288.0	0.70	0.18	2.00
334.22	333.8	0.42	0.18	2.00
361.26	360.8	0.46	0.18	2.00
418.48	418.2	0.28	0.18	2.00
446.70	446.0	0.70	0.18	2.00
453.20	453.1	0.10	0.18	2.00
460.06	459.6	0.46	0.18	2.00
536.90	536.4	0.50	0.18	2.00
637.94	637.6	0.34	0.18	2.00
440.74	440.1	0.64	0.18	2.00
472.22	472.0	0.22	0.18	2.00
513.70	513.5	0.20	0.18	2.00
528.72	528.2	0.52	0.18	2.00
574.60	574.3	0.30	0.18	2.00
585.48	585.0	0.48	0.20	2.00
684.63	684.2	0.43	0.18	2.00
740.27	740.0	0.27	0.20	2.00
748.28	747.8	0.48	0.18	2.00
807.16	806.8	0.36	0.18	2.00
879.70	879.2	0.50	0.18	2.00

Remark : - LUC = Unit Under Calibration
- N/A = Not Available
- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k.
which for a normal distribution corresponds to a coverage probability of approximately 95%
- * Indicates not TISI accredited

- End of Certificate -

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FM-708-02 R01 1/11/2021



PinAAcle 900F Preventive Maintenance Report

Company Name: UAE Consultant Co., LTD.
Instrument Location: 41 Sukumvit Rd.,
Phra Khanong, Bangkok 10260
Instrument Serial No.: PFBS20031902
Date: 14-May-2024

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PinAAcle 900F Preventive Maintenance (PM)

Company Name:	United Analyst and Engineering Consultant Co., LTD.		
Address (Instrument Location):	41 Sukumvit Rd., Phra Khanong, Bangkok 10260		
Serial Number:	PFBS20031902	PM Number:	2 of 2
Customer Name (If applicable):	K. Yinda	Telephone Number:	095-5580049
Customer Support Engineer Name:	K. Chayanon	Service Order Number:	WO-02787590
Date PM Performed: (DD-MM-YY)	14-May-2024	Next PM Due Date: (DD-MM-YY)	14-Nov-2024
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370145 Rev.9	A	January 2018	

Scope
The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.
The customer should save their method before the PM begins.

General Instructions:
The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.
The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
PinAAcle900F	PFBS20031902	Syngistix V.4.0.1.193.5
Flas100(New Install)	100524040501	

Parts Lists

Parts Included with the PM		
Part Number (If applicable)	Description	Quantity
B0501696	Fan Filters	N/A
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	N/A
N9301714	Replacement Acetylene Filter Cartridge	N/A
TH001022	Replacement Air Filter Cartridge	N/A

Additional Reagents and Standards Required for PM				
Part Number (If applicable)	Description	Quality	Batch/Lot #	Expired Date (mm/yy)
N9300183	1000 mg/L Copper Standard	AR	27-39CUY1	Apr 2025

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (If applicable)	Description	Quantity	Batch/Lot #	Expiration (mm/yy)
N/A	DI Water	250 mL	AR	AR
N/A	0.5% HNO ₃	250 mL	AR	AR

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Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	101N0089015
N1013002	1.0A Neutral density filter	1	101N0089015
03030997	System 2 EDL Driver	1	03030997
N3050805	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	060419-030180
N3050109	Ba Lumina HCL	1	061219-020041
N3050139	K Lumina HCL	1	030819-010130
N3050152	Ni Lumina HCL	1	052719-020020

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Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the Instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when lighting the Air-C2H2 and N2O-C2H2 flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcLe 900 Series Pre-Installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

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7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choking Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

B. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certification Value at 853.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9995	1.0143	Passed
0.2 A ND Filter	± 5% from Cert.	0.1936	0.1966	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.002	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

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8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0001	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.002	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0022	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.8005	Passed

10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

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Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F ☒ Passes ☐ Fails the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:	Date:
<i>Chayanon R.</i>	14-May-2024
Authorized Customer Representative:	Date:
<i>สุวิทย์ ๑๑๑</i>	14-May-2024

PinAAcle 900F Preventive Maintenance Report (PM)

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
634/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL.0-2717-3000-29 FAX 0-2719-9484



Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.165/2561(ENV.pH.04/61)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-0882WSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomeuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10280

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemagatrakul

Approved by :
Approved Signatory

() Unnophol Harachal
() Porpan Paipim
(✓) Salthip Meangmal

Issue Date : 29 August 2024

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43180086	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	2311216	10 Oct 2024

- This Certification is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lange GmbH LI Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

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

Buffer Solution

Manufacturer	Lot No.	Exp. date
pH 4.006 Hach Lange GmbH	C03146	23 Feb 2026
pH 6.969 Hach Lange GmbH	C03146	28 Feb 2026
pH 9.997 CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: JC02729	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



Cert.No.: 24CH1070
Page: 3 of 3

Calibration Results

Function: pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode SNL: 231018SIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe,

- Model: -

- Serial No.: 231018SIA605377

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 k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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 %.

-00-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 24MM282
Page: 1 of 3

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Serial No.: 1129361010
ID No.: UAE.WAS.002/2552
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udumak 41, Sukhumvit Road,
Bangchak, Phraekhanong,
Bangkok 10200
Location: Balance Room (106)
Received order: 11 May 2024
Calibration Date: 11 May 2024
Ambient Temperature: 15 °C to 40 °C
Relative Humidity: 30 % to 90 %
Calibrated by: Khiti Rutanaprapachat
Kunchit
Approved by: Approved Signatory
() Ponpan Palpin
() Sumit Injal
(✓) Kunchit Prompret

Issue Date: 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment: Electronic Balance
Condition As-Received: Used Item
Reference: 2405-0166OC-1

Cert.No.: 24MM292
Page: 2 of 3

Procedure used >

Calibration were conducted using in-house calibration procedure CP-0801 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard Instruments:

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
Standard Weight Set (E2)	15884	24053	76RC007	MM-0013-24	25 Jan 2028

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 certificate is traceable to the International System of Unit.

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

Range capacity: 0 g to 220 g Resolution 0.0001 g

Before Adjustment:

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.18	2.03
200	200.0005	-0.0006	0.30	2

After Adjustment:

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

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005



Equipment: Electronic Balance
Condition As-Received: Used Item
Reference: 2405-0166OC-1

Cert.No.: 24MM292
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

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unloaded	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9998	+0.0001	0.18	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 15, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 65
Serial No. : B212.0411
ID No. : UAE.WAO.0052556
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 : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Kulsida Malee

Approved by :

() Ponpan Palpim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 5 April 2024

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 Service 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม
A 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Procedure Used :-

Cert. No.: 24TM589
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

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

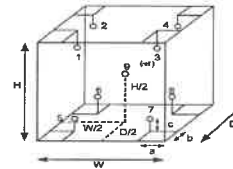
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humd. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No. : @ Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.6	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.464	103.847	104.226	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.468	120.069	120.635	120.596	119.531	119.844	120.364	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.570	179.594	179.790	180.267	179.961	179.802	1.1

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 1209738



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 24TM847
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E6
Serial No. : 20200000015535
ID No. : UAE.MIC.018/2594
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 : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpalboon
Approved by :
() Ponpan Palpim
(✓) Suwit Imjai
() Kunchit Promprat
Issue Date : 7 April 2024

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 Service 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-003OC-8
Procedure Used :-

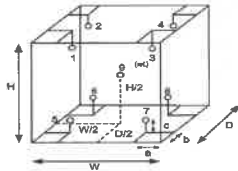
Cert. No.: 24TM647
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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

- Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY48023832	Z3LM122	TPA	26 Jul 2024
 - This certificate is valid only to the item calibrated on date and place of calibration.
 - This certification is traceable to the International System of Unit.
- Remark : TPA : Technology Promotion Association (Thailand - Japan)
- Result of Calibration :- (°) Without Adjustment
- Function of UUC* : Temperature Source
- Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL. Humid. (%)	54	57
AC Supply (Volt)	221	223

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09

Probe Installation Details : Dimension of Chamber :

a = 10 cm	D = 0.48 m
b = 10 cm	W = 0.65 m
c = 10 cm	H = 1.2 m
	Capacity = 0.37 m ³

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-003OC-8
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM647
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	0.30

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 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



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

Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2954
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomek 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Wasalek Sirithaan
Approved by :
() Pornthippa Taneyakul
() Unnopphol Harsachal
(✓) Sathip Meangmal
Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page: 2 of 2

Condition of this result of calibration

- Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024
- Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was certified only for the Instrument we tested. It is allowable to use for study intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR2050U

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawutpong
Scientist

Approved by

(Mr.Pharephat Tuenjit)

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

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-005 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR2050U
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 2 of 4

Date of Calibration: 2 April 2024

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 7.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**

Standard Weight Class E2 1mg to 200g 8505557572 TCS M23040535 8 April 2024

Instrument **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**

Thermo-Hygro Meter 608-411 NFI.BTH.016/23 Quality Reborn QR24-0343 9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

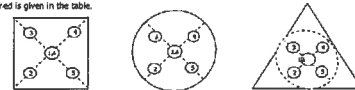
2. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000532
80	0.0000063
100	0.0000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR2050U
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 3 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	k
Unload	0.000000	0.00000	0.00000	0.0000088	2.00
0.001	0.001003	0.00101	-0.00001	0.0000091	2.00
0.005	0.005003	0.00499	0.00001	0.0000094	2.00
0.01	0.010003	0.01000	0.00000	0.0000091	2.00
0.05	0.049995	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000003	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00002	0.00001	0.000037	2.00
30	30.000040	30.00003	0.00001	0.000052	2.00
50	50.000028	50.00004	-0.00001	0.000068	2.00
80	80.000058	80.00005	0.00002	0.00011	2.00

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR2050U
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 4 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	k
90	90.000010	90.00000	0.00001	0.000015	2.00
100	100.000006	100.00000	0.00001	0.000015	2.00
110	110.000007	110.00001	0.00000	0.000017	2.00
120	120.000009	120.00000	0.00001	0.000019	2.00
130	130.000010	130.00000	0.00001	0.000019	2.00
140	140.000014	140.00000	0.00001	0.000020	2.00
150	150.000009	150.00001	0.00000	0.000020	2.00
160	160.000010	160.00001	0.00000	0.000022	2.00
170	170.000012	170.00001	0.00000	0.000023	2.00
200	200.000016	200.00000	0.00002	0.000028	2.00

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

----- End -----

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

Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Prakhong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jarawut Prapawuttipong **Approved by** 
Scientist (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 9 April 2024

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.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 2 of 4

Date of Calibration: 2 April 2024
Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %
Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Condition of Equipment: Good Condition
Condition of This Results of Calibration:
1. Calibration Method: N1 Method W-NA-001 In-House Method based on UKAS Lab 14 : 2015
2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505557572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFJETH 016/23	Quality Robom	QR24-0343	9 February 2025

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

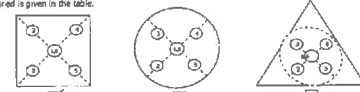
Calibration Results:

1. Repeatability of Reading:

Normal Value (g)	Standard Deviation of Reading (g)
40	0.000043
80	0.0000152
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.
The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 3 of 4

Date of Calibration: 2 April 2024
Calibration Results: (Continued)
Calibration Range: 0 - 80 g
Calibration Adjustment: Internal Calibration

3. Departure from Nominal Values (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
Unload	0.000000	0.000002	0.000002	0.0000086	2.00
0.001	0.001003	0.001011	-0.000008	0.0000089	2.00
0.005	0.005003	0.005000	0.000003	0.0000092	2.00
0.01	0.010003	0.010000	0.000003	0.0000089	2.00
0.05	0.050003	0.050000	0.000003	0.0000096	2.00
0.1	0.100011	0.100002	0.000009	0.000011	2.00
0.5	0.500015	0.500001	0.000014	0.000014	2.00
1	1.000003	1.000002	-0.000002	0.000015	2.00
2	2.000023	2.000001	0.000022	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000020	2.00
10	10.000025	10.000000	0.000025	0.000026	2.00
20	20.000031	20.000000	0.000031	0.000037	2.00
30	30.000040	30.000001	0.000039	0.000050	2.00
50	50.000078	50.000002	0.000076	0.000058	2.00
80	80.000068	80.000002	0.000066	0.00011	2.00

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 4 of 4

Date of Calibration: 2 April 2024
Calibration Results: (Continued)
Calibration Range: 81 - 200 g
Calibration Adjustment: Internal Calibration

3. Departure from Nominal Values (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
90	90.000010	90.000001	0.000009	0.000015	2.00
100	100.000005	100.000001	0.000004	0.000015	2.00
110	110.000007	110.000001	0.000006	0.000016	2.00
120	120.000009	120.000000	0.000009	0.000017	2.00
130	130.000013	130.000000	0.000013	0.000019	2.00
140	140.000014	140.000000	0.000014	0.000020	2.00
150	150.000009	150.000001	0.000008	0.000020	2.00
160	160.000010	160.000001	0.000009	0.000022	2.00
170	170.000012	170.000001	0.000011	0.000023	2.00
200	200.000015	200.000002	0.000013	0.000028	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 %.

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



Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.195/2561(ENV.pH.04/81)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-0882WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakom Lerngagrakul

Approved by :

Approved Signatory

() Unnopphol Harachai
() Porpan Palpin
(✓) Saitip Meangmai

Issue Date : 28 August 2024

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.



Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188060	130RC044	231216	10 Oct 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

The measurement results are traceable to SI through Hach Lange GmbH LI
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1635

Buffer Solution

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2026
pH 8.996	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: JC02729	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



Cert.No.: 24CH1070
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 231018SIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe,

- Model : -

- Serial No. : 231018SIA605377

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 k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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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Certificate of Calibration

Cert. No.: 24TM647
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E8
Serial No. : 2020000015535
ID No. : UAE.MIC.018/2584
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhemong,
Bangkok 10250
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongsaboon
Approved by :
() Ponpan Paipim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 7 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-8
Procedure Used :-

Cert. No.: 24TM647
Page : 2 of 3

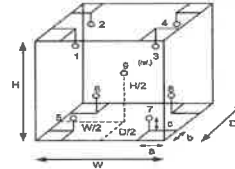
Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

- Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023832	Z3LM122	TPA	26 Jul 2024
 - This certificate is valid only to the item calibrated on date and place of calibration.
 - This certification is traceable to the International System of Unit.
- Remark : TPA : Technology Promotion Association (Thailand - Japan)
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	54	57
AC Supply (Volt)	221	223



Probe Installation Details :

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

Dimension of Chamber :

D = 0.48 m
W = 0.65 m
H = 1.2 m
Capacity = 0.37 m³

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	22-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-8
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM647
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	0.30

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



ศูนย์บริการและสนับสนุนด้านวิทยาศาสตร์และเทคโนโลยีอาหาร
ศูนย์บริการและสนับสนุนด้านวิทยาศาสตร์และเทคโนโลยีอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhemong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C009071672
ID No.: UAE.WAO.012/2563
Order No.: 2402283
Operation No.: 2402283-001
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

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

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C09071872
ID No.: UAEWAO.D12/2563
Capacity: 220 g

Date of Calibration: 2 April 2024
Page 2 of 4
Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %
Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Condition of Equipment: Good Condition
Condition of This Results of Calibration:
1. Calibration Method: NFI Method W-M-001 In-House Method based on UKAS Lab 14 : 2019
2. Reference Standards:
Reference Standard Model Serial No. Calibrated By Certificate No. Due Date
Standard Weight Class E1 1mg to 200g 850567572 TCS H23040335 8 April 2024
Instrument Model Serial No. Calibrated By Certificate No. Due Date
Thermo-Hygro Meter 608-H1 NFI.BTH D16/23 Quality Reborn Q824-0343 9 February 2025
3. This certification is traceable to SI UNIT
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000032
80	0.000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table

1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C09071872
ID No.: UAEWAO.D12/2563
Capacity: 220 g

Date of Calibration: 2 April 2024
Page 2 of 4
Calibration Results: (Continued)
Calibration Range: 0 - 80 g
Calibration Adjustment: Internal Calibration
3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unload	0.00000	0.00000	0.00000	0.000008	2.00
0.001	0.001003	0.001001	-0.000002	0.000009	2.00
0.005	0.005003	0.004995	0.000008	0.000009	2.00
0.01	0.010003	0.010000	0.000003	0.000009	2.00
0.05	0.049995	0.050000	0.000005	0.000008	2.00
0.1	0.100011	0.100000	0.000011	0.000011	2.00
0.5	0.500016	0.500001	0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000002	0.000016	2.00
2	2.000003	2.000001	0.000002	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000023	2.00
10	10.000009	10.000000	0.000009	0.000025	2.00
20	20.000031	20.000002	0.000029	0.000037	2.00
30	30.000040	30.000003	0.000037	0.000052	2.00
50	50.000028	50.000004	0.000024	0.000068	2.00
80	80.000008	80.000005	0.000003	0.000111	2.00

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C09071872
ID No.: UAEWAO.D12/2563
Capacity: 220 g

Date of Calibration: 2 April 2024
Page 4 of 4
Calibration Results: (Continued)
Calibration Range: 81 - 200 g
Calibration Adjustment: Internal Calibration
3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
90	90.00010	90.00000	0.00010	0.00015	2.00
100	100.00008	100.00000	0.00008	0.00015	2.00
110	110.00007	110.00001	0.00006	0.00017	2.00
120	120.00009	120.00000	0.00009	0.00018	2.00
130	130.00010	130.00000	0.00010	0.00019	2.00
140	140.00014	140.00000	0.00014	0.00020	2.00
150	150.00009	150.00001	0.00008	0.00020	2.00
160	160.00010	160.00001	0.00009	0.00022	2.00
170	170.00012	170.00001	0.00011	0.00023	2.00
200	200.00016	200.00000	0.00016	0.00028	2.00

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

***** End *****

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

Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the installation.

Note: While non-current production AA instrument and or accessory models are not covered specifically in this document it can be used as a basic reference.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.agilent.com/en-us/services>

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Revision: 10.00, Issued: November 2021

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Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>
- Need technical support, FAQs, supplies? – visit our Support Home page at <http://www.agilent.com/search/support>
- Get answers. Share insights. Build connections. Join the Agilent Community at <https://community.agilent.com/welcome>

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice.

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Instrument Maintenance

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID

Instrument System Site and Location

UNITED ANALYST AND ENGINEERING CONSULTANT / 2nd Lab

List System Component Product Numbers

1. G 8432 A
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.

List the Serial Numbers of each Component

MY 0316 00001

Preparation, Safe operation and Initial performance checks

Agilent AA 55/240/280 Preventive Maintenance

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Preparation, Safe operation and Initial performance checks

FLAME SYSTEM section

☐ Section not applicable

Electronic components

- ☒ Review and confirm instrument configuration data in SVD
- ☒ Confirm power supply voltages using the SVD Power Supply diagnostic.
- ☒ For Dual Beam Instruments - Confirm RFG frequency using the SVD RBC frequency diagnostic.

Mechanical components

- ☒ Check the burner actuator controls for complete and free movement. If the burner actuator needs lubrication, use Molykote 551 or mineral-based multi-purpose oil (high pressure).
- ☒ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☒ Monochromator drive
 - ☒ Slit drive
 - ☒ Lamp selector
 - ☒ ABA w/r

Optics components

- ☒ Check that external optical surfaces are clean – Clean or replace as required.
- ☒ Use SVD and perform Mono Wavelength Correction.
- ☒ Use SVD and perform Slit Calibration.
- ☒ Use SVD and perform Grating Squareness Diagnostic.
- ☒ Use SVD and perform Zero Order Offset/Mono Correction.
- ☒ Use SVD and perform Wavelength Repeatability.
- ☒ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gas for each lamp. Advise customer if lamps are showing emission degradation due to age.
- ☒ Check that the signal energy of the D2 and HC lamps track properly. Advise customer if the D2 lamp is showing emission degradation due to age.

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Sample Introduction and Atomization

- ☒ Inspect the burner interlock plate to ensure that the interlock pin is secure and correct for the burner type.
- ☒ Clean the burner slot with a clean white card.
- ☒ Check the uniformity of the slot width.
- ☒ Clean the burner if required.
- ☒ Change the burner o-ring.
- ☒ Clean the nebulizer, spray chamber and liquid trap.
- ☒ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ☒ Check that the pressure relief bung releases readily.
- ☒ Change o-rings on the fuel and oxidant delivery bars.
- ☒ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ☒ Refill liquid trap and check that overflow drains freely into the drain/waste tube.
- ☒ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel.
- ☒ Check and clean the igniter electrode

Gas handling components and safety interlocks

- ☒ Pressure test for leaks
- ☒ Leak test gasbox internal components and connections
- ☒ Check safety interlock status and operation using the SVD interlock monitoring diagnostic.

Analytical performance for Flame systems

- ☒ Ignite a flame.
- ☒ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
- ☒ Optimize the instrument ready to perform Cu sensitivity test.
- ☒ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing"
- ☒ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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FURNACE SYSTEM section

☒ Section not applicable

Electronic components

- ☐ Review and confirm instrument configuration data in SVD
- ☐ Confirm power supply voltages using the **SVD Power Supply diagnostic**.

Mechanical components

- ☐ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☐ Monochromator drive
 - ☐ Sift drive
 - ☐ Lamp selector

Optics components

- ☐ Check that external optical surfaces are clean – Clean or replace as required.
- ☐ Use SVD and perform **Mono Wavelength Correction**.
- ☐ Use SVD and perform **Sift Calibration**.
- ☐ Use SVD and perform **Grating Squareness Diagnostic**.
- ☐ Use SVD and perform **Zero Order Offset/Mono Correction**.
- ☐ Use SVD and perform **Wavelength Repeatability**.
- ☐ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.

Gas handling, water system and workhead component checks

- ☐ Inspect the GTA workhead gas hoses and connections for leaks.
- ☐ Pressure test for gas leaks
- ☐ If the cooler system is accessible (stand-alone) check for correct operation and coolant/water level – this includes any temperature and pressure settings plus filter cleaning (air flow and water).
- ☐ Inspect the GTA workhead water hoses and connections for leaks.
- ☐ Check all graphite components and replace if necessary.

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- ☐ Tube
- ☐ Electrodes
- ☐ Shroud

- ☐ Check and clean the end windows on the workhead.
- ☐ Check safety interlock operation.

Analytical performance for Furnace systems

- ☐ Optimize the instrument ready to perform Cu sensitivity test.
- ☐ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

☒ Section NOT Applicable

- ☐ Check condition of the PSD capillary – replace if necessary
- ☐ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ☐ Change PSD rinse bottle o-ring.
- ☐ Check and clean the rinse vessel.
- ☐ Check the drain tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel.
- ☐ Ensure that the waste vessel is suitable for use with the furnace system.

Sample introduction pump system (SIPS) accessory

☒ Section NOT Applicable

- ☐ Re-torque screws securing the hubs, presser arms and pump rotors.
- ☐ Adjust each roller so that it rotates freely
- ☐ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth.
- ☐ Ensure that the presser arms and the surfaces near the pump are free from dirt and spills.
- ☐ Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion.
- ☐ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ☐ Check clips securing the diluents holder and replace if necessary.
- ☐ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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- ☐ Remove the T-piece by disconnecting the pump tubes, the pump bands and all other tubing.
- ☐ Place the T-piece in an ultrasonic bath containing strong detergent 1-5% Decon 30 or similar, for approximately 5-10 minutes.
- ☐ Wash the T-piece under a tap with a strong flow of water.
- ☐ Rinse with distilled water through all of the inlets in the reverse direction to normal sample flow.
- ☐ Reassemble.

Sample preparation system (SPS 4) accessory

☒ Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler.

- ☐ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent.
- ☐ Cleaning the autosampler cover panels with domestic window cleaner.
- ☐ Checking the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.

For further details refer to the SPS 4 service manual G8410-90050.

Sample preparation system (SPS 3) accessory

☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there are any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions – adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 # Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions – Calibrate if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Revision: 10.00, Issued: November 2021

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เอกสารไม่ควบคุม

Vapor generation accessory VGA (hydride generator)

☒ Section NOT Applicable

- ☐ Inspect VGA gas supply hose.
- ☐ Inspect/replace VGA pump tubing.
- ☐ Check low gas pressure interlock setting – adjust if required.
- ☐ Check precision orifice gas flow setting – adjust if required.
- ☐ Check gas regulator pressure to 46 psi (325 kPa) – adjust if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

UltrAA lamp accessory (external)

☒ Section NOT Applicable

- ☐ Check the condition of the power cable.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

- ☒ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Revision: 10.00, Issued: November 2021

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เอกสารไม่ควบคุม

Signature Page

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Lock/restart instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Remove this consumable parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.

Test Results

Test Description

Flame optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	44 %
Flame performance test with 5 ppm copper sample		
Air/acetylene, mixing paddle removed	Abs value > 0.5	0.7401 A
Air/acetylene, mixing paddle installed, 10 replicates	%RSD < 1.0	0.5 % RSD
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	N/A
Deuterium furnace performance test with 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0 %	N/A
Abs value	> 0.15	N/A
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0 %	N/A
Abs value	≥ 0.10	N/A
MSRP	≥ 70 %	N/A

Agilent CrossLab Instrument Model D21

Agilent CrossLab Instrument Model



เอกสารไมค์ควบคุม

AA consumable and parts list table

Part Description	Product/Model # where used	PM supplied or Consumable	Instrument Type
Test Solution - Cu 5ppm solution	6610030100	PM supplied	Common
Test Solution - Blank solution	5190-7001	PM supplied	Common
Copper, 1000 ug/ml, 100ml	5190-8279	PM supplied	Common
Kr, Mk 7 O-rings, aqueous, complete set	6910093400	PM supplied	Flame
Organic Kit	9910093500	PM supplied	Flame
Wire Nebulizer Cleaning	9910024700	consumable	Flame
Tubing-Capillary Std Nebs	9910024800	consumable	Flame
Capillary Tube H.vac Neb (3) (organics only)	9910044000	consumable	Flame
Glass impact beads (5/pt)	9910025700	consumable	Flame
Teflon impact beads (5/pt) (organics only)	9910053300	consumable	Flame
Burner cleaning strip (100/pt)	9910058900	consumable	Flame
Window UV silica - round (right side)	2010082600	PM supplied	Common
Window UV silica - rectangular (left side)	2010082500	PM supplied	Common
Pad adhesive window (round)	4910012700	PM supplied	Common
Pad adhesive window (rectangular)	4910012900	PM supplied	Common
Electrode kit (1 pt) (D2)	6310003400	PM supplied	Furnace
Shroud (D2)	6310003100	PM supplied	Furnace
Zeeman electrode kit (1 pt)	6310003500	PM supplied	Furnace
Zeeman shroud	6310003600	PM supplied	Furnace
O-ring PSD rinse bottle	6910025900	PM supplied	Furnace

* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM

Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

Agilent CrossLab Instrument Model D21

Agilent CrossLab Instrument Model



เอกสารไมค์ควบคุม

Service Engineer Comments (optional)

Service Engineer Comments (optional)

Service Completion

Service request number: 6006371115
Date service completed: 24 January 2024
Agilent signature: Woravit T.
Customer signature: [Signature]
Total number of pages in this document: 13

Agilent CrossLab Instrument Model D21

Agilent CrossLab Instrument Model



เอกสารไมค์ควบคุม

SVD Results Report



Customer: [Name]
Address: [Address]
Service Engineer: Woravit T.
Contact Details: [Phone]
Instrument Configuration
Configuration:
Serial Number: MY13160001
Instrument Model: Varian AA140/240/280
Flame Instrument: True
Furnace Instrument: True
Zeeman Present: False
Internal Zeeman: False
Internal UltrAA: False
Optics Type: Double Beam
D2 BG Correction Fitted: True
Boot Block Version: 1.09
Turret Type: Automatic
Number Of Lamps: 4
Mono Type: Automatic
Gasbox Type: Y Gas Box
Auto Burner Adjuster: False
Mains Frequency: 50
Firmware Version: 2.11
Photomultiplier Type: Normal(900nm)
PWB Version: 45

EEPROM Data:

Instrument Run Hours: 62809.832
Zero Wavelength Offset: 30.148
Mono Correction: 0.765
Flame Hours: 28802.416
D2 Run Hours: 49138.000
D2 Serial Number: not set 1
D2 Install Date: 1/1/1970
D2 Original Intensity: 1.000
D2 Last Intensity: 475.000

Frequency:

Averaging Period: 30.0
Datapoint Count: 20
Upper Limit: 51.00
Average Frequency: 50.00
Highest Measured Frequency: 50.00
Lower Limit: 49.00
Lowest Measured Frequency: 50.00

Result: Passed

Report Generated At: 1/24/2024 10:11:16 AM

1

SVD Results Report

เอกสารไมค์ควบคุม

Power Supply:

Averaging Period: 30.0
Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00V Rail	10.80	12.19	13.20	Passed
-12.00V Rail	-13.20	-11.90	-10.80	Passed
5.00V Rail	4.50	5.05	5.50	Passed
310.00V Rail	279.00	320.00	341.00	Passed

Report Generated At: 1/24/2024 10:11:18 AM

2

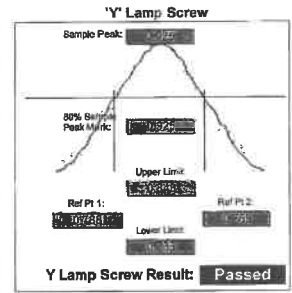
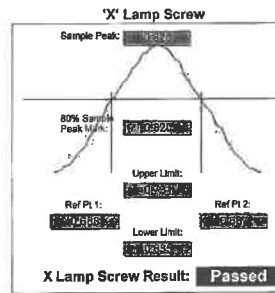
SVD Results Report
เอกสารไม่ควบคุม

Optics

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3

Peak Selected: 324.80
Lamp Alignment: Performed



Grating Squareness:

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: Performed

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.76	325.15	Passed
Second Order	648.23	649.52	649.97	Passed

Report Generated At: 1/24/2024 10:11:18 AM

3

SVD Results Report
เอกสารไม่ควบคุม

Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.750
Connected to Socket: 3
Lamp Current(mA): 4
Slit Width(nm): 0.2
Slit Height: Normal

Lamp Alignment: Performed

Lower Limit(nm)	324.768	324.888	Upper Limit(nm)
(Approach from Zero Order)		(Approach from end)	
Sample 1:	324.828	Sample 2:	324.828
Sample 3:	324.828	Sample 4:	324.823
Sample 5:	324.823	Sample 6:	324.823
Sample 7:	324.823	Sample 8:	324.823
Sample 9:	324.823	Sample 10:	324.823

Mean: 324.825

Standard Deviation: 0.002

Result: Passed

Report Generated At: 1/24/2024 10:11:18 AM

4

SVD Results Report
เอกสารไม่ควบคุม

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	261	297	Passed
S1	156	165	191	Passed
S2	271	288	332	Passed
S3	474	507	579	Passed
S4	825	918	1008	Passed
S5	1435	1628	1754	Passed
S6	2486	2769	3053	Passed
S7	4347	4762	5313	Passed

Interlocks:

Burner Fitted:	Working	Flame Detect:	Working
N2O Burner Fitted:	Untested	GCU Active:	Working
Flame Shield Closed:	Working	Oxidant Pressure:	Working
Gas Control Fitted:	Untested	Oxidant Changeover:	Untested
Pressure Release Bung Fitted:	Working	Ignition:	Working
Liquid Trap Fitted:	Working		

Report Generated At: 1/24/2024 10:11:18 AM

5

SVD Results Report
เอกสารไม่ควบคุม

Lamp 1: Uncoded Lamp/Not Connected	Lamp 5: Not Supported
Lamp 2: 87 - Silver/Cadmium/Lead/Zinc(UltrAA) (Ag/C	Lamp 6: Not Supported
Lamp 3: 14 - Copper (Cu)	Lamp 7: Not Supported
Lamp 4: Uncoded Lamp/Not Connected	Lamp 8: Not Supported

Result: Passed

Not Performed

PM 24 Jan 2024

David - 20/1/24 Date Worswit T. 24/1/24 Date

Report Generated At: 1/24/2024 10:11:16 AM

6

SVD Results Report SVD

เอกสารไม่ควบคุม

1/24/2024 11:46 AM
Page 1 of 1

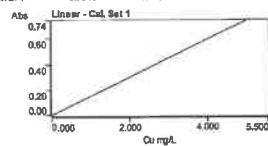
SpectrAA

Analyst	
Date Started	1/24/2024 11:39 AM GMT: 1/24/2024 4:39 AM
Worksheet	Cu 5 PPM Sense check
Comment	
Method	Cu
Computer name	DESKTOP-RSUIFRS
Serial Number:	MY13160001

Method: Cu (Flame)

Sample ID	Conc. mg/L	%RSD	Mean Abs
CAL ZERO	0.000	55.0	0.0003
	Readings		
	0.0002	0.0002	0.0004

STANDARD 1	5.000	1.7	0.7419	
	Readings			
	0.7274	0.7515	0.7468	1/24/2024



Curve Fit	= Linear
Characteristic Conc	= 0.028 mg/L
r	= 1.0000
Calculated Conc	= 0.000 5.000
Residuals	= 0.000 0.000

$$A_{\text{hs}} = 0.14833 \times C + 0.00028$$

Sample 001	4.985	0.7	0.7401	
Readings	0.7454	0.7899	0.7349	1/24/2024

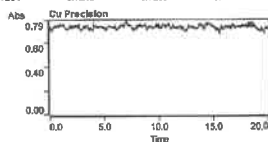
1/24/2024 11:50 AM
Page 1 of 1

SpectrAA

Analyst	
Date Started	1/24/2024 11:47 AM GMT: 1/24/2024 4:47 AM
Worksheet	Qu 5 PPM Precision
Comment	
Methods	Qu
Computer name	DESKTOP-R9L4FRS
Serial Number:	MY13180001

Method: Cu (Flame)

Sample ID	Exp. Abs	%RSD	Mean Abs			
Cu Precision	0.723	0.6	0.7232			
	Readings					
	0.7221	0.7195	0.7226	0.7263	0.7278	0.7260
	0.7201	0.7213	0.7268	0.7174	12/4/2024	



UNITED ANALYST AND ENGINEERING CONSULTANT COMPANY Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 17780278

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : 09 July 2024

PM by : Pradit mayong

(Pradit M.)

Approved by : 

(Kitichai S.)



Coax Group Corporation Ltd.

1131/62,64,325-331 Nakornchaisri road,
Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand
Tel. 02-2435263, 02-6682436 Fax. 02-2437386

เอกสารไม่ครบ

เอกสารไม่ควบคุม

Inspection result

ITEM	STANDARD	RESULT	JUDGE
1. Self Check			
1.1 Heating		PASS	OK
1.2 Cooling		PASS	OK
1.3 Leak		PASS	OK
1.4 Optical system		PASS	OK
1.5 Drift		PASS	OK
2. Analytical curve inspection[AREA]			
2.1 No Pretreatment (Low Conc.)	Correlation coefficient (r) ≥ 0.9990	0.9999	OK
3. Repeatability[AREA]			
3.1 No Pretreatment 100ppb, n=3			
	1. 99.60 ppb		
	2. 101.84 ppb		
	3. 101.22 ppb		
	C.V. ≤ 5%	1.15%	OK
4. Blank	Below 1.0 [AREA]	0.1002	OK

เอกสารไม่ควบคุม

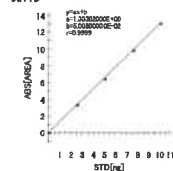
Counter

Measurement Count	2027/11-05-05	Clear	P1 Value(123456789)	0.0000000000	Clear
Memory Exhaust Filter Amount(ppb)	1000000000000	Clear	P2 Value(123456789)	0.0000000000	Clear
Long Action Time(00000)	001000000000	Clear	P3 Value(123456789)	0.0000000000	Clear
Membrane Filter Change Time(00000)	000000000000	Clear	P4 Value(123456789)	0.0000000000	Clear
			P5 Value(123456789)	0.0000000000	Clear
Water Pump Value(0000)	000000000000	Clear	P6 Value(123456789)	0.0000000000	Clear
Probe Area Lamp Time	000000000000	Clear	P7 Value(123456789)	0.0000000000	Clear

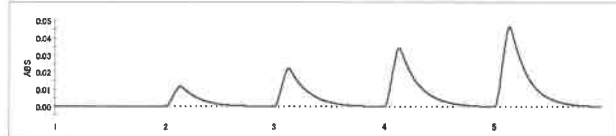
เอกสารไม่ควบคุม

Title : Preventive Maintenance RA-4500 sn:17780278
Date : 2024-07-09
Name : Coax Group
Memo : Calibration Curve 0-10ng

Calib



No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Note
1	100.000	0.000	5.000	5.000	0.000	0.0846	0.0265	-	
2	100.000	0.025	5.000	5.000	2.500	3.9464	2.5298	1.2	
3	100.000	0.050	5.000	5.000	5.000	6.4170	4.8863	2.3	
4	100.000	0.075	5.000	5.000	7.500	9.8647	7.5322	0.4	
5	100.000	0.100	5.000	5.000	10.000	13.1192	10.0253	0.3	



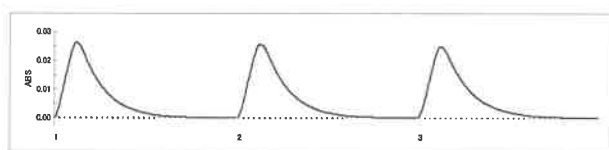
No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
1	100ppb	0.050	5.000	5.000	6.5389	4.9796	99.60	
2	100ppb	0.050	5.000	5.000	6.6848	5.0918	101.84	
3	100ppb	0.050	5.000	5.000	6.6446	5.0610	101.22	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	100ppb	3	100.887	1.15660	1.15

เอกสารไม่ควบคุม

NIC NIPPON INSTRUMENTS CORPORATION



Self Check

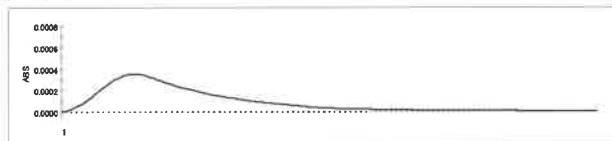
Heat check: PASS!! (26.3degC[05:00] -> 30.3degC[02:29])
Sensor check: PASS!! (SS - 10 = 43)
Leak check: PASS!! (0.16L/min)
Sig/Ref check: PASS!! (Sig:4.00V, Ref:4.02V)
Drift check: PASS!! (0.0000661 - -0.0000179 = 0.0000240)

เอกสารไม่ควบคุม

NIC NIPPON INSTRUMENTS CORPORATION

Title : Preventive Maintenance RA-4500 sn:17780278
Date : 2024-07-09
Name : Coax Group
Memo : Blank

SNP							
No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ION]	MEAS [ng]	CONC [ug/L]
1	Blank DI				0.1002	0.0885	



-3-

เอกสารไม่ควบคุม
NIG HANON INSTRUMENTS CORPORATION

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeserviceinfo@gmail.com



CERTIFICATE OF CALIBRATION

Certificate No. : SP24-001

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

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

Location of calibration : Laboratory 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 4 January 2024

Calibration Date : 4 January 2024

Issue Date : 5 January 2024

Condition Instrument : Good

Calibrated by : ธนวิศว์
(Mr. Tanawat Rittidach)
Technical Manager

Approved by : ชัชวาลย์
(Ms. Chutabicha Sangnorn)
Quality Manager

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

This document is the property of the laboratory and its use is limited to the specific instrument and the unit of measurement indicated at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeserviceinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP24-001

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeserviceinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP24-001

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Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.520	0.0030	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.516	0.0021	0.0031	2.00
	1.0002	0.997	0.0032	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.550	0.0017	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.558	0.0011	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP24-001

Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000 0.7469	0.000 0.743	0.0000 0.0039	0.0050 0.0057	2.00 2.00
257	0.0000 0.8674	0.000 0.862	0.0000 0.0054	0.0050 0.0059	2.00 2.00
313	0.0000 0.2919	0.000 0.289	0.0000 0.0029	0.0050 0.0051	2.00 2.00
350	0.0000 0.6430	0.000 0.641	0.0000 0.0020	0.0050 0.0055	2.00 2.00

เอกสารไม่ควบคุม

FM-706-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP24-001

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.2	0.52	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.4	0.41	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.4	0.19	0.18	2.00
445.94	445.8	0.14	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.4	0.19	0.18	2.00
637.98	638.0	-0.02	0.18	2.00
431.38	431.2	0.18	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.4	-0.23	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	684.4	0.00	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.1	-0.07	0.18	2.00
879.28	879.5	-0.22	0.18	2.00

Remark : - UUC - Unit Under Calibration

- N/A - Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

- * Indicates non TISI accredited

- End of Certificate -

เอกสารไม่ควบคุม

FM-706-02 R01 1/11/2021



PinAAcle 900F Preventive Maintenance Report

Company Name: UAE Consultant Co., LTD.

Instrument Location: 41 Sukumvit Rd.,
Phra Khanong, Bangkok 10260

Instrument Serial No.: PFBS20031902

Date: 14-May-2024

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PinAAcle 900F Preventive Maintenance (PM)

Company Name:	United Analyst and Engineering Consultant Co., LTD.		
Address (Instrument Location):	41 Sukumvit Rd., Phra Khanong, Bangkok 10260		
Serial Number:	PFBS20031902	PM Number:	2 of 2
Customer Name (If applicable):	K. Yinda	Telephone Number:	095-5580049
Customer Support Engineer Name:	K. Chayanon	Service Order Number:	WO-02787590
Date PM Performed: (DD-MM-YYYY)	14-May-2024	Next PM Due Date: (DD-MM-YYYY)	14-Nov-2024
Standard Labor Hours to Complete PM :			5 hours

Part Number	Release	Publication Date
09370145 Rev.9	A	January 2018



Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.
The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.
The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
PinAAcLe900F	PF8520031902	Syngistix V.4.0.1.1935
Flas100(New Install)	100524040501	

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	N/A
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	N/A
N9301714	Replacement Acetylene Filter Cartridge	N/A
TH001022	Replacement Air Filter Cartridge	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expired Date (mm/yy)
N9300183	1000 mg/L Copper Standard	AR	27-39CUY1	Apr 2025

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (mm/yy)
N/A	DI Water	250 mL	AR	AR
N/A	0.5% HNO ₃	250 mL	AR	AR

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Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	101N0089015
N1013002	1.0A Neutral density filter	1	101N0089015
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	060419-030180
N3050109	Ba Lumina HCL	1	061219-020041
N3050139	K Lumina HCL	1	030819-010130
N3050152	Ni Lumina HCL	1	052719-020020

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Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, backed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary.
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking slot width. Replace if out of specification.
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary).
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcLe 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

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7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9995	1.0143	Passed
0.2 A ND Filter	± 5% from Cert.	0.1936	0.1966	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.020	0.002	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

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8.4 D₂ Background Compensation with Copper

Description: Verifies the Instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0001	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.002	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0022	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.8005	Passed

10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

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Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F ☒ Passes ☐ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:	Date:
Chayanon K	14-May-2024
Authorized Customer Representative:	Date:
สุวิทย์ น้อย	14-May-2024

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TEL:0-2717-3000-29 FAX:0-2719-9484



Certificate of Calibration

Cert.No.: 24CH1070
Page: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.195/2561(ENV.pH.04/61)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-0882WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lerngatrakul

Approved by : _____
Approved Signatory
() Unnopphol Hanachai
() Ponpan Palpim
(✓) Sathip Meangmal
Issue Date : 29 August 2024

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 24CH1070
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160065	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2189080	130RC044	231216	10 Oct 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lange GmbH LI Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	870853	25 Apr 2025

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	mV	pH		
pH Meter S/N.: JC02729	4.00	177.48	177	4.01	7.00	0.58	2.00
	7.00	0.00	0	7.00	7.00	0.58	2.00
	7.00	0.00	0	7.00	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	10.01	0.58	2.00



Cert.No.: 24CH1070
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 2310183IA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	9.997	10.00	-176	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe,

- Model :

- Serial No. : 2310183IA605377

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 (\pm °C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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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TEL.0-2717-3000-25 FAX.0-2718-3484



Certificate of Calibration

Cert. No.: 24TM647
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E8
Serial No. : 2020000015535
ID No. : UAE.MIC.018/2564
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10250
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (26 \pm 10) °C
Relative Humidity : (50 \pm 30) %
Calibrated by : Man Pattanapongpalboon
Approved by :
() Ponpen Palpim
(✓) Sunvit Injai
() Kunchit Promprat
Issue Date : 7 April 2024

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 : 2404-0003OC-6
Procedure Used :
Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Cert. No.: 24TM647
Page : 2 of 3

Condition of this result of calibration

1. Reference standard Instrument-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	23LM122	TPA	26 Jul 2024

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

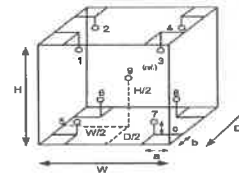
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration : (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close





Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0008OC-8
Result of Calibration : (") Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM847
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	0.30

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.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.195/2561(ENV.pH.04/61)
Condition As-Received : Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-082WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgagrakul

Approved by : _____
Approved Signatory

() Unnophol Harachai
() Porpan Palpin
(✓) Saltrip Meangmai

Issue Date : 28 August 2024

The Uncertainties are for a confidence probability of approximately 95%

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(under)

Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	2311216	10 Oct 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lange GmbH LI Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2025
pH 6.969	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: JC02729	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



Cert.No.: 24CH1070
Page: 3 of 3

Calibration Results

Function: pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode SnL: 23101BSIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model: -

- Serial No.: 23101BSIA605377

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 k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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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Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1128361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Kirit Ruttanaprasachal
Approved by : Kunchit
Approved Signatory
() Ponpan Paipim
() Sumit Injai
(✓) Kunchit Prompral

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM292
Page: 2 of 3

Procedure used :-

Calibration were conducted using In-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard Instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15894	24053	70RC007	MM-0013-24	25 Jan 2028

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- 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 220 g Resolution 0.0001 g

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM292
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

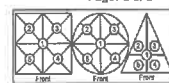
Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9998	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 15, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 65
Serial No. : B212.0411
ID No. : UAE.WAO.005/2556
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Krida Maleo

Approved by :

() Ponpan Palpin
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 5 April 2024

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 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3

Cert. No.: 24TM589
Page : 2 of 3

Procedure Used :-

Calibration was conducted using calibration procedure CP-0202 based on TLA8 G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard Instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

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

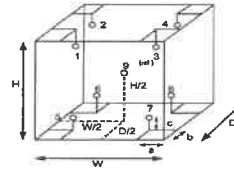
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (°) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.484	103.847	104.226	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.480	120.089	120.636	120.696	119.531	119.844	120.364	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.670	179.594	179.790	180.287	179.961	179.802	1.1

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 1209738



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 15, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Certificate of Calibration

Cert. No.: 24TM847
Page : 1 of 3

Equipment : Incubator
Manufacturer : Binder
Model : KB 400 E5
Serial No. : 2020000015535
ID No. : UAE.MIC.018/2594
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 01 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Ponpan Palpin
(✓) Suwit Imjai
() Kunchit Promprat
Issue Date : 7 April 2024

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 : 2404-0003OC-B

Cert. No.: 24TM647
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard Instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	23LM122	TPA	26 Jul 2024

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

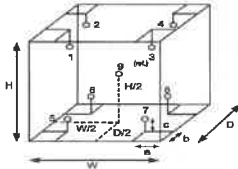
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	54	57
AC Supply (Volt)	221	223

Position :	Ref. Std. ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	20-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	22-16RTD-08
9 (ref.)	22-16RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.48 m
W = 0.85 m
H = 1.2 m
Capacity = 0.37 m³

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-B
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM647
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.035	0.19	0.22	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.000	35.022	34.841	34.851	35.027	35.011	35.023	35.028	35.007	0.30

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

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration

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

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

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

Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0620DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udornasuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Watolek Sirithan

Approved by :
Approved Signatory

() Pornthippa Taneyakul
() Unnophol Harachal
(✓) Sathip Meangmal

Issue Date : 22 February 2024

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Cert.No.: 24TW39
Page: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100126

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.20	8.19	0.0055

This report was certified only for the Instrument we tested.It is allowable to use for study
Intend to use for advertising and referral purpose is prohibited.This report may not be reproduced
other in full,without written approval of the laboratory

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มูลนิธิศูนย์ส่งเสริมมาตรฐานอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C089071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by

(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

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



มูลนิธิศูนย์ส่งเสริมมาตรฐานอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C089071872
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard Model Serial No. Calibrated By Certificate No. Due Date

Standard Weight Class E2 1mg to 200g B505567572 TCS M23040535 8 April 2024

Instrument Model Serial No. Calibrated By Certificate No. Due Date

Thermo-Hygro Meter 606-H1 NFI.BTH 016/23 Quality Reborn QR24-0343 9 February 2025

3. This certification is traceable to SI UNIT

4. This certification is certified only for the instrument we calibrated.

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

Calibration Results:

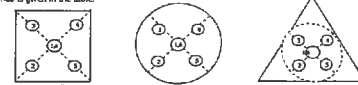
1. Repeatability of Reading:

Nominal value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

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



มูลนิธิศูนย์ส่งเสริมมาตรฐานอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C089071872
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor F
Unloaded	0.000000	0.000000	0.000000	0.000000	2.00
0.001	0.001003	0.001011	-0.000008	0.000009	2.00
0.005	0.005003	0.005009	-0.000006	0.000009	2.00
0.01	0.010003	0.010009	-0.000006	0.000009	2.00
0.05	0.050006	0.050009	-0.000003	0.000008	2.00
0.1	0.100011	0.100009	0.000002	0.000011	2.00
0.5	0.500016	0.500011	0.000005	0.000014	2.00
1	1.000023	1.000022	-0.000002	0.000016	2.00
2	2.000023	2.000021	0.000002	0.000017	2.00
5	5.000017	5.000022	-0.000005	0.000020	2.00
10	10.000029	10.000029	0.000000	0.000026	2.00
20	20.000031	20.000022	0.000009	0.000037	2.00
30	30.000040	30.000033	0.000007	0.000052	2.00
50	50.000028	50.000034	-0.000006	0.000068	2.00
80	80.000066	80.000055	0.000011	0.000111	2.00

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



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C089071872
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor F
90	90.000010	90.000000	0.000010	0.000015	2.00
100	100.000006	100.000000	0.000006	0.000015	2.00
110	110.000007	110.000001	0.000006	0.000017	2.00
120	120.000009	120.000001	0.000008	0.000018	2.00
130	130.000010	130.000000	0.000010	0.000019	2.00
140	140.000014	140.000000	0.000014	0.000020	2.00
150	150.000009	150.000001	0.000008	0.000020	2.00
160	160.000010	160.000001	0.000009	0.000022	2.00
170	170.000012	170.000001	0.000011	0.000023	2.00
200	200.000016	200.000000	0.000016	0.000028	2.00

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

----- End -----

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



มูลนิธิศูนย์บริการข้อมูลอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Prakhong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by: Mr.Jesawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

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



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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 2 of 4

Date of Calibration: 2 April 2024

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B59557572	ICS	M23945335	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.ETH 016/23	Quality Reborn	QR24-03-03	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

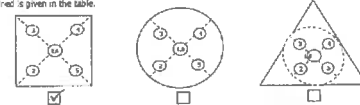
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



(g)	1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	100.0000	0.0001

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



มูลนิธิศูนย์บริการข้อมูลอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unloaded	0.000000	0.00000	0.00000	0.0000036	2.00
0.001	0.001002	0.00101	-0.00001	0.0000039	2.00
0.005	0.005003	0.00500	0.00000	0.0000092	2.00
0.01	0.010003	0.01000	0.00000	0.0000039	2.00
0.05	0.050005	0.05000	0.00000	0.0000036	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000013	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000025	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00000	0.00003	0.000037	2.00
30	30.000040	30.00001	0.00003	0.000050	2.00
50	50.000078	50.00002	0.00001	0.000068	2.00
80	80.000068	80.00002	0.00005	0.00011	2.00

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



มูลนิธิศูนย์บริการข้อมูลอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 4 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
90	90.00010	90.00001	0.00009	0.000015	2.00
100	100.00006	100.00001	0.00005	0.000015	2.00
110	110.00007	110.00001	0.00006	0.000016	2.00
120	120.00008	120.00000	0.00008	0.000017	2.00
130	130.00010	130.00000	0.00010	0.000019	2.00
140	140.00014	140.00000	0.00014	0.000020	2.00
150	150.00009	150.00001	0.00008	0.000020	2.00
160	160.00010	160.00001	0.00009	0.000022	2.00
170	170.00012	170.00001	0.00011	0.000023	2.00
200	200.00016	200.00002	0.00014	0.000028	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 %.

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

Calibration Certificate

Certificate No.: 2402420-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: B108115858

ID No.: UAE.AIR.016/2555


Order No.: 2402420

Operation No.: 2402420-001

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by Mr.Pheraphat Tuanjit
Scientist

Approved by 
(Miss Preesaporn Jaengkamit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

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.: 2402420-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Page 2 of 3

Environment Condition: Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 49 ± 1.9 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-NA-003 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15840	TCS	M23111815	28 November 2024
Standard Weight Class E2	1-500g	15852	TCS	M23111825	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 019/23	Quality Reborn	Q24-0492	4 March 2025

3. This certificate is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000057
200	0.000079

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.

1	2	3	4	5	6	(Average Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
99.9999	99.9997	99.9996	99.9995	100.0000	99.9999	0.0003

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

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024 Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unload	0.00000	0.0000	0.0000	0.000089	2.00
0.1	0.10000	0.1000	0.0000	0.000089	2.00
1	0.99998	1.0000	0.0000	0.000092	2.00
5	4.99997	5.0000	0.0000	0.000091	2.00
10	10.00002	10.0001	-0.0001	0.00012	2.00
20	20.00003	20.0001	-0.0001	0.00014	2.00
50	49.99998	50.0000	0.0000	0.00012	2.00
70	70.00000	69.9999	0.0001	0.00015	2.00
100	99.99997	100.0000	0.0000	0.00017	2.00
150	149.99994	149.9997	0.0002	0.00022	2.00
200	200.00001	199.9995	0.0005	0.00028	2.00

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

----- End -----

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

Calibration Certificate

Certificate No.: 2402420-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: B108115858

ID No.: UAE.AIR.016/2555


Order No.: 2402420

Operation No.: 2402420-001

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by Mr.Pheraphat Tuanjit
Scientist

Approved by 
(Miss Preesaporn Jaengkamit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

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.: 2402420-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: 8108115858
Capacity: 220 g
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024 Page 2 of 3

Environment Condition: Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 49 ± 1.9 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-M4-001 In House Method based on UKAS L20 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M23111815	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M23111825	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	606-H1	NFI.BTH 019/23	Quality Room	QR24-0492	4 March 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000057
200	0.000079

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table:

1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
99.9999	99.9997	99.9996	99.9998	100.0000	99.9998	0.0001

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

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: 8108115858
Capacity: 220 g
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024 Page 2 of 3

Environment Condition: Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 49 ± 1.9 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-M4-001 In House Method based on UKAS L20 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M23111815	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M23111825	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	606-H1	NFI.BTH 019/23	Quality Room	QR24-0492	4 March 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
Unload	0.00000	0.0000	0.0000	0.000089	2.00
0.1	0.10000	0.1000	0.0000	0.000089	2.00
1	0.99999	1.0000	0.0000	0.000092	2.00
5	4.99997	5.0000	0.0000	0.000091	2.00
10	10.00002	10.0001	-0.0001	0.00012	2.00
20	20.00003	20.0001	-0.0001	0.00014	2.00
50	49.99998	50.0000	0.0000	0.00012	2.00
70	70.00000	69.9999	0.0001	0.00016	2.00
100	99.99997	100.0000	0.0000	0.00017	2.00
150	149.99994	149.9997	0.0002	0.00023	2.00
200	200.00001	199.9995	0.0005	0.00028	2.00

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

End

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

Calibration Certificate

Certificate No.: 2402420-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: 8108115858

ID No.: UAE.AIR.016/2555


Order No.: 2402420

Operation No.: 2402420-001

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by Mr.Pheraphat Tuanjit
Scientist

Approved by 
(Miss Preeyaporn Jaengharatit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: 8108115858
Capacity: 220 g
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024 Page 2 of 3

Environment Condition: Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 49 ± 1.9 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-M4-001 In House Method based on UKAS L20 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M23111815	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M23111825	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	606-H1	NFI.BTH 019/23	Quality Room	QR24-0492	4 March 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000057
200	0.000079

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table:

1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
99.9999	99.9997	99.9996	99.9998	100.0000	99.9998	0.0001

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

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115658
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024

Page 2 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustments: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unload	0.0000	0.0000	0.0000	0.000095	2.00
0.1	0.10000	0.10000	0.00000	0.000089	2.00
1	0.99998	1.00000	0.00002	0.000092	2.00
5	4.99997	5.00000	0.00003	0.000091	2.00
10	10.00002	10.00001	-0.00001	0.00012	2.00
20	20.00003	20.00001	-0.00002	0.00014	2.00
50	49.99998	50.00000	0.00002	0.00012	2.00
70	70.00000	69.99999	-0.00001	0.00016	2.00
100	99.99997	100.00000	0.00003	0.00017	2.00
150	149.99994	149.99997	-0.00003	0.00022	2.00
200	200.00001	199.99991	-0.00010	0.00028	2.00

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

----- End -----

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

Calibration Certificate

Certificate No.: 2402420-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: B108115658

ID No.: UAE.AIR.016/2555

Order No.: 2402420

Operation No.: 2402420-001

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by: Mr. Pheraphat Tuanjit
Scientist

Approved by: *P. Jaengphobhit*
(Miss Preesaporn Jaengphobhit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115658
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024

Page 2 of 3

Environment Condition: Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 49 ± 1.5 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M23111815	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M23111815	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608 HI	HF18TH C10/23	Quality Return	QR24-0492	4 March 2025

3. This certificate is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000057
200	0.000079

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.

1	2	3	4	5	6	(Mean) (g)
99.9999	99.9997	99.9996	99.9998	100.0000	99.9998	0.0003

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

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115658
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustments: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unload	0.00000	0.00000	0.00000	0.000095	2.00
0.1	0.10000	0.10000	0.00000	0.000089	2.00
1	0.99998	1.00000	0.00002	0.000092	2.00
5	4.99997	5.00000	0.00003	0.000091	2.00
10	10.00002	10.00001	-0.00001	0.00012	2.00
20	20.00003	20.00001	-0.00002	0.00014	2.00
50	49.99998	50.00000	0.00002	0.00012	2.00
70	70.00000	69.99999	-0.00001	0.00016	2.00
100	99.99997	100.00000	0.00003	0.00017	2.00
150	149.99994	149.99997	-0.00003	0.00022	2.00
200	200.00001	199.99991	-0.00010	0.00028	2.00

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

----- End -----

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-5484



Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JC02729
ID No. : UAE.EFM.195/2561 (ENV.pH.04/61)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2408-0862WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lernagatrakul

Approved by : _____
Approved Signatory

() Unnophol Harachai
() Ponpan Palpim
(✓) Sathip Meangmai
Issue Date : 29 August 2024

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.



1-1



Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	23I1216	10 Oct 2024

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lange GmbH & Co. KG
Deutsche Akkreditierungsstelle, Accredited No.D-RI-15184-01-00

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	Hach Lange GmbH	C03148	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970653	25 Apr 2025

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 Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: JC02729	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



Cert.No.: 24CH1070
Page.: 3 of 3

Calibration Results

Function: pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 231018SIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe:

- Model :
- Serial No. : 231018SIA605377
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 k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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 %.

-00-



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129381010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Kunt Ratanaprapachai
Approved by :
() Ponpan Palpin
() Suwit Injai
(✓) Kunt Ratanaprapachai

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 65%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used :-

Cert.No.: 24MM292
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14
according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard Instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- 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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม

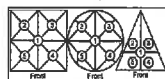


Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM292
Page: 3 of 3

2. Effect of off center loading

A mass of 100 g was placed at 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)
0.0001

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9999	+0.0001	0.30	2

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 %.

-000-

เอกสารไม่ควบคุม



Certificate of Calibration

Cert. No.: 24TM589
Page: 1 of 3

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 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krida Maloe
Approved by :
() Ponpan Palpin
(✓) Suwit Injai
() Kunt Ratanaprapachai

Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม
A 0065065

Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawat Prapawuttipong
Scientist

Approved by

(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

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.

FC-S-009 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Date of Calibration: 2 April 2024

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standards **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**

Standard Weight Class E2 Lmg to 200g BSC557572 TCS M23940535 8 April 2024

Instrument **Model** **Serial No.** **Calibrated By** **Certificate No.** **Due Date**

Thermo-Hygro Meter 608+11 NFI.BTH 016/23 Quality Reborn QR24-0343 9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000052
80	0.0000063
100	0.0000018
200	0.0000053

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

FC-S-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	k
Unload	0.000000	0.000000	0.000000	0.0000088	2.00
0.001	0.001003	0.001001	-0.000001	0.0000091	2.00
0.005	0.005002	0.005000	-0.000002	0.0000094	2.00
0.01	0.010003	0.010000	-0.000003	0.0000091	2.00
0.05	0.049996	0.049990	-0.000006	0.0000098	2.00
0.1	0.100011	0.100000	-0.000011	0.000011	2.00
0.5	0.500016	0.500001	-0.000015	0.000014	2.00
1	1.000002	1.000002	-0.000002	0.000016	2.00
2	2.000023	2.000001	-0.000022	0.000017	2.00
5	5.000017	5.000002	-0.000015	0.000020	2.00
10	10.000009	10.000000	-0.000009	0.000026	2.00
20	20.000031	20.000002	-0.000029	0.000037	2.00
30	30.000040	30.000003	-0.000037	0.000052	2.00
50	50.000028	50.000001	-0.000027	0.000068	2.00
80	80.000068	80.000005	-0.000063	0.00011	2.00

FC-S-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.00001 g / 0.0001 g
Serial No.: C009071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Date of Calibration: 2 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	k
90	90.000010	90.000000	-0.000010	0.000015	2.00
100	100.000005	100.000000	-0.000005	0.000015	2.00
110	110.000007	110.000001	-0.000006	0.000017	2.00
120	120.000009	120.000000	-0.000009	0.000019	2.00
130	130.000010	130.000000	-0.000010	0.000019	2.00
140	140.000014	140.000000	-0.000014	0.000020	2.00
150	150.000009	150.000001	-0.000008	0.000020	2.00
160	160.000010	160.000001	-0.000009	0.000022	2.00
170	170.000012	170.000000	-0.000012	0.000023	2.00
200	200.000016	200.000000	-0.000016	0.000028	2.00

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

----- End -----

FC-S-012 Revision: 01 Date: 20-04-65

Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 43, SUKHUMVIT ROAD,
Bangchack, Prakanhong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by: Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

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.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 2 of 4

Date of Calibration: 2 April 2024

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

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

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standard:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B555567372	YCS	MJ3040335	8 April 2024
Instrument	Model	Serial No. <td>Calibrated By <td>Certificate No. <td>Due Date</td> </td></td>	Calibrated By <td>Certificate No. <td>Due Date</td> </td>	Certificate No. <td>Due Date</td>	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 016/23	Quilly Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

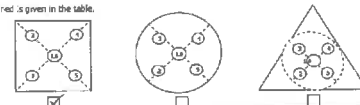
1. Repeatability of Reading:

Normal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 3 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
Unloaded	0.000000	0.00000	0.00000	0.0000385	2.00
0.001	0.001003	0.00101	-0.00001	0.0000389	2.00
0.005	0.005003	0.00500	0.00000	0.0000392	2.00
0.01	0.010003	0.01000	0.00000	0.0000389	2.00
0.05	0.049996	0.05000	0.00000	0.0000396	2.00
0.1	0.100011	0.10000	0.00001	0.0000411	2.00
0.5	0.500016	0.50001	0.00000	0.0000414	2.00
1	1.000003	1.00000	-0.00000	0.0000316	2.00
2	2.000021	2.00001	0.00001	0.0000317	2.00
5	5.000017	5.00002	0.00000	0.0000320	2.00
10	10.000009	10.00000	0.00000	0.0000326	2.00
20	20.000031	20.00000	0.00003	0.0000337	2.00
30	30.000010	30.00001	0.00000	0.0000350	2.00
50	50.000078	50.00007	0.00000	0.0000368	2.00
80	80.000068	80.00007	0.00000	0.0000411	2.00



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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 4 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
90	90.000010	90.00001	0.00000	0.0000315	2.00
100	100.000006	100.00001	0.00000	0.0000315	2.00
110	110.000007	110.00001	0.00000	0.0000316	2.00
120	120.000009	120.00000	0.00001	0.0000317	2.00
130	130.000019	130.00000	0.00001	0.0000319	2.00
140	140.000014	140.00000	0.00001	0.0000320	2.00
150	150.000009	150.00001	0.00000	0.0000320	2.00
160	160.000010	160.00001	0.00000	0.0000322	2.00
170	170.000012	170.00001	0.00000	0.0000323	2.00
200	200.000016	200.00007	0.00000	0.0000328	2.00

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

----- End -----

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



List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Extech Tornado Standard Calibrator	Total Suspended Particulate (TSP)	Anderson Instruments, Inc.	GC26	Innovative Associates Co., Ltd.	COF-002-66	14 Jul 23	13 Jul 25	
2	U-Tube Massometer	Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1991	Technology Promotion Association (Thailand-Japan)	28P1231	11 Apr 24	10 Apr 25	
3	Memot Biomometer	Particulate Matter < 10 µm (PM ₁₀)	Bergo, Germany		Technology Promotion Association (Thailand-Japan)	28P1369	22 Apr 24	21 Apr 25	
4	Biol Thermo-Hygrometer	Total Suspended Particulate (TSP)	Bergo, Germany	-	Technology Promotion Association (Thailand-Japan)	28P1533	10 Apr 24	9 Apr 25	
5	Nitrogen Dioxide Analyzer	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	421	UAE Consultant Co., Ltd.	21112023	21 Nov 23	20 Nov 24	
6	Standard Gases (Mixture)	Nitrogen Dioxide	Aligas	0402177951	Aligas air & liquids company	ES049FE1500014	6 Jun 23	6 Jun 31	
7	Sulfur Dioxide Analyzer	Sulfur Dioxide	Thermo Scientific	451	UAE Consultant Co., Ltd.	09112023	11 Nov 23	8 Nov 24	
8	Standard Gases (Mixture)	Sulfur Dioxide	Aligas	1182920015	Aligas air & liquids company	ES049FE1500014	6 Jun 23	6 Jun 31	
9	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	481	UAE Consultant Co., Ltd.	13112023	13 Nov 23	12 Nov 24	
10	Standard Gases (Mixture)	Carbon Monoxide	Aligas	ES0162121	Aligas air & liquids company	ES049FE1500014	6 Jun 23	6 Jun 31	

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Horiba	LAQUAP-H10 H400005	Technology Promotion Association (Thailand-Japan)	26C039	10 Jun 24	9 Jun 25	

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Workplace									
1	Primary Flow Calibrator	Calibrate personal pump	TBI Inc	4146	Innovative Instrument Co., Ltd.	24-PM010 Rev.1	23 Jun 24	22 Jun 25	
2	Air Sampling Pump	Chlorine	Sensidyne	41465922068 GMAx 3	Innovative Instrument Co., Ltd.	24-AP-015	14 Jun 24	13 Jun 25	-
3	Memot Biomometer	Chlorine	Bergo, Germany	20180102018	Technology Promotion Association (Thailand-Japan)	28P1145	9 Apr 24	8 Apr 25	
4	Biol Thermo-Hygrometer	Chlorine	Bergo, Germany		Technology Promotion Association (Thailand-Japan)	28P1756	10 Apr 24	9 Apr 25	
5	Sound Level Collector (Acoustic Calibration)	Calibrate Sound Level Meter	Sennok	SV05	Innovative Instrument Co., Ltd.	24-AC-088	25 Jun 24	24 Jun 25	
6	Noise Downmeter	Noise Downmeter	Sennok	44783	Innovative Instrument Co., Ltd.	24-NDM-172	13 Jul 24	14 Jul 25	
7	Noise Downmeter	Noise Downmeter	Sennok	SV 104	Innovative Instrument Co., Ltd.	24-NDM-108	24 Apr 24	23 Apr 25	
8	Noise Downmeter	Noise Downmeter	Sennok	117694	Innovative Instrument Co., Ltd.	24-NDM-170	13 Jul 24	14 Jul 25	
9	Thermal Environment Monitor	Heat Meter	TS OUEST	143229	Innovative Instrument Co., Ltd.	24-THM-323	16 Jul 24	15 Jul 25	
10	Thermal Environment Monitor	Heat Meter	TS OUEST	QuantTemp 34 TD040012	Innovative Instrument Co., Ltd.	24-THM-310	15 Jul 24	13 Jul 25	
11	Digital Lux Meter	Lux	Etech Instrument, Taiwan	407026	Innovative Instrument Co., Ltd.	24-LXM-051	29 Mar 24	28 Mar 25	
12	Light Meter	Lux	Etech Instrument, Taiwan	407026	Innovative Instrument Co., Ltd.	24-LXM-080	25 Mar 24	24 Mar 25	

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Horiba	LAQUAP-P120 H41M0053	Technology Promotion Association (Thailand-Japan)	26C0310	13 Mar 24	12 Mar 25	

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	HANNA	LIQUA-PH210 161100016	Technology Promotion Association (Thailand Regional)	2602010	20 Feb 24	17 Feb 25	

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	HANNA	LIQUA-PH210 161100016	Technology Promotion Association (Thailand Regional)	2601260	20 Feb 24	17 Feb 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Workplace									
1	Digital Lux Meter	Lux	Epoch Instrument, Taiwan	487036 A 92262	Innovative Instrument Co., Ltd.	26-LUM-153	30 May 24	27 May 25	
2	Air Flow Meter	Calibrate personal pump	TS/INC	4146 4146J131030	Innovative Instrument Co., Ltd.	23-IRM-219 Rev.1	23 Oct 23	26 Oct 24	
3	Revised Barometer	Altitude	Bergo, Germany		Technology Promotion Association (Thailand Asian)	2491310	22 Apr 24	21 Apr 25	
4	Digital Thermo - Hygrometer	Humidity	Digicon	TH-02 399204173	Technology Promotion Association (Thailand Japan)	20H116	10 Apr 24	9 Apr 25	

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Workplace									
1	Digital Lux Meter	Lux	Epoch Instrument, Taiwan	487036 A 92262	Innovative Instrument Co., Ltd.	26-LUM-153	30 May 24	29 May 25	
2	Air Flow Meter	Calibrate personal pump	TS/INC	4146 4146J131030	Innovative Instrument Co., Ltd.	23-IRM-219 Rev.1	25 Oct 23	26 Oct 24	
3	Revised Barometer	Altitude	Bergo, Germany		Technology Promotion Association (Thailand Japan)	2491310	22 Apr 24	21 Apr 25	
4	Digital Thermo - Hygrometer	Humidity	Digicon	TH-02 399204173	Technology Promotion Association (Thailand Japan)	20H116	10 Apr 24	9 Apr 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments, Inc.	G25A 1901	Jenbacher Associates Co., Ltd.	CDF-002-66	14 Jul 23	13 Jul 25	-
2	J-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-WMA	Technology Promotion Association (Thailand-Japan)	20P1251	11 Apr 24	30 Apr 25	-
3	Personal Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Braigo, Germany	-	Technology Promotion Association (Thailand-Japan)	20P1367	22 Apr 24	21 Apr 25	-
4	Real Time Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Braigo, Germany	-	Technology Promotion Association (Thailand-Japan)	20H153	10 Apr 24	9 Apr 25	-
5	Monitor Meter	Acceleration Level	Innovative Inc.	Insta44	Calibration Laboratory Co.Ltd	25300637	12 Jun 24	11 Jun 25	-
6	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Swatek	72142091/72142591 5106 107724	Innovative Instrument Co.Ltd.	24-ACT-091	26 Jun 24	25 Jun 25	-
7	Sound Level Meter	Acoustic Calibrator	Larsen Davis	LuT1	Innovative Instrument Co.Ltd.	Q253003061A	28 Aug 24	27 Aug 25	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Hanna	LAQ14A-24-010 H41M00056	Technology Promotion Association (Thailand-Japan)	24C1240	20 Feb 24	19 Feb 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments, Inc.	G25A 1901	Jenbacher Associates Co., Ltd.	CDF-002-66	14 Jul 23	13 Jul 25	-
2	J-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-WMA	Technology Promotion Association (Thailand-Japan)	20P1251	11 Apr 24	10 Apr 25	-
3	Personal Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Braigo, Germany	-	Technology Promotion Association (Thailand-Japan)	20P1307	22 Apr 24	21 Apr 25	-
4	Real Time Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Braigo, Germany	-	Technology Promotion Association (Thailand-Japan)	20H153	10 Apr 24	9 Apr 25	-
5	Monitor Meter	Acceleration Level	Innovative Inc.	Insta44	Calibration Laboratory Co.Ltd	25300637	12 Jun 24	11 Jun 25	-
6	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Swatek	72142091/72142591 5106 107724	Innovative Instrument Co.Ltd.	24-ACT-091	26 Jun 24	25 Jun 25	-
7	Sound Level Meter	Acoustic Calibrator	Larsen Davis	LuT1	Innovative Instrument Co.Ltd.	Q253003061A	28 Aug 24	27 Aug 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments, Inc.	G25A 1901	Jenbacher Associates Co., Ltd.	CDF-002-66	14 Jul 23	13 Jul 25	-
2	J-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-WMA	Technology Promotion Association (Thailand-Japan)	20P1251	11 Apr 24	10 Apr 25	-
3	Personal Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Braigo, Germany	-	Technology Promotion Association (Thailand-Japan)	20P1367	22 Apr 24	21 Apr 25	-
4	Real Time Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Braigo, Germany	-	Technology Promotion Association (Thailand-Japan)	20H153	10 Apr 24	9 Apr 25	-
5	Monitor Meter	Acceleration Level	Thermo Scientific	425	UAE Consultant Co.Ltd.	01112023	1 Nov 23	31 Oct 24	-
6	Standard Gases (Mixture)	Nitrogen Dioxide	Argos	COMB130002 EB0162121 2016596	Argos an Air Liquide company	ES06N01E15A0014	6 Jun 23	6 Jun 25	-
7	Calphur Dioxide Analyzer	Calphur Dioxide	Thermo Scientific	431	UAE Consultant Co.Ltd.	09112023	9 Nov 23	8 Nov 24	-
8	Standard Gases (Mixture)	Nitrogen Dioxide	Argos	EB0162121 2016596	Argos an Air Liquide company	ES06N01E15A0014	6 Jun 23	6 Jun 25	-
9	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	408	UAE Consultant Co.Ltd.	10112023	10 Dec 23	19 Dec 24	-
10	Standard Gases (Mixture)	Nitrogen Dioxide	Argos	EB0162121 2016596	Argos an Air Liquide company	ES06N01E15A0014	6 Jun 23	6 Jun 25	-
11	Monitor Meter	Acceleration Level	Innovative Inc.	Macnoise UM15410	Calibration Laboratory Co.Ltd	Q2010294	15 Sep 23	14 Sep 24	-
12	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Swatek	5096	Innovative Instrument Co.Ltd.	24-ACT-091	26 Jun 24	25 Jun 25	-
13	Sound Level Meter	Acoustic Calibrator	Larsen Davis	LuT1	Innovative Instrument Co.Ltd.	23-SLM-203	29 Aug 23	28 Aug 24	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Horiba	LAQUA-PH210 H0800046	Technology Promotion Association (Thailand-Japan)	24CH48	10 Jan 24	9 Jan 25	

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Horiba	LAQUA-PH210 H0800046	Technology Promotion Association (Thailand-Japan)	24CH48	10 Jan 24	9 Jan 25	

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Trace Transfer Standard	Total Suspended Particulate (TSP)	Anderson Instruments, Inc.	G25A	Jintanate Associates Co., Ltd.	COF-002-66	14 Jul 23	13 Jul 25	
2	Calibrator	Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1931	Technology Promotion Association (Thailand-Japan)	24PT231	11 Apr 24	10 Apr 25	
3	J-Tube Manometer	Total Suspended Particulate (TSP)	Baigo, Germany	1273-56-WM1	Technology Promotion Association (Thailand-Japan)	24PT167	22 Apr 24	21 Apr 25	
4	Advanced Barometer	Particulate Matter < 10 µm (PM ₁₀)	Baigo, Germany	1273-56-WM1	Technology Promotion Association (Thailand-Japan)	24PT167	22 Apr 24	21 Apr 25	
5	Thermo-Hygrometer	Particulate Matter < 10 µm (PM ₁₀)	Baigo, Germany	1273-56-WM1	Technology Promotion Association (Thailand-Japan)	24PT167	22 Apr 24	21 Apr 25	
6	Calibration Meter	Acceleration level	Inspektel Inc.	Inspektel	Calibration Laboratory Co., Ltd.	25300697	13 Jun 24	13 Jun 25	
7	Sound Level Calibrator	Acoustic Sound Level Meter	Sony	5006	Innovative Instrument Co., Ltd.	24ACT091	26 Jun 24	25 Jun 25	
8	Sound Level Meter	Acoustic Sound Level Meter	Larsen Dens	107224	Innovative Instrument Co., Ltd.	CP08003NEA	28 Aug 24	27 Aug 25	



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2711-3000-29 FAX. 0-2719-4884



Cert.No.: 24CH39
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0A0005
ID No. : UAEFM.004/2583(EFM.pH.04/63)
Condition As-Received: Used Item
Received Date : 09 January 2024
Calibration Date : 10 January 2024
Reference : 2401-0219WSC-2
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagtrakul

Approved by : 
Approved Signatory

(✓) Sathip Meangmal
() Warakorn Lemgagtrakul
() Ponpan Palpim

Issue Date : 15 January 2024

The Uncertainties are for a confidence probability of approximately 95 %
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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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A 0062455



Cert.No.: 24CH39
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4882054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.886	CPA chem	931959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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 (\pm mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: HAQA0005	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	10.00	-177.48	-177.2	10.01	0.058	2.00

Sathip
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a 1197727



Cert.No.: 24CH39
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 991L0051	4.008	4.02	155.5	0.0065	2.05
	6.886	7.00	-18.4	0.0093	2.00
	6.886	7.00	-18.2	0.011	2.00
	9.997	10.01	-189.0	0.0096	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :	9652
- Serial No. :	991L0051
Dimension of probe;	
- Length :	103 mm
- Diameter :	16 mm
- Immersion Depth :	90 mm

Calibration Point ($^{\circ}$ C)	Standard Temperature ($^{\circ}$ C)	UUC* Reading ($^{\circ}$ C)	Error ($^{\circ}$ C)	Uncertainty of measurement (\pm $^{\circ}$ C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
35.0	35.003	34.9	-0.103	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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2716-9484



Cert.No.: 24CH39
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HAQA0005
ID No. : UAE.EFM.004/2583(EFM.pH.04/83)
Condition As-Received: Used Item
Received Date : 09 January 2024
Calibration Date : 10 January 2024
Reference : 2401-0219WSC-2
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10260
Ambient Temperature : (25 \pm 2.5) $^{\circ}$ 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 : Warekom Lemgagtrakul

Approved by : 
Approved Signatory

(☒) Sathip Meangnial
(☐) Warekom Lemgagtrakul
(☐) Ponpan Palpin

Issue Date : 15 January 2024

The Uncertainties are for a confidence probability of approximately 95 %

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Approval of the Head of Corporate Services : Equipment Calibration and Testing Services.

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A 0062455



Cert.No.: 24CH39
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4882054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.886	CPA chem	931959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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 (\pm mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: HAQA0005	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	10.00	-177.48	-177.2	10.01	0.058	2.00

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a 1197727



Cert.No.: 24CH39
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 991L0051	4.008	4.02	155.5	0.0085	2.05
	6.866	7.00	-18.4	0.0093	2.00
	6.866	7.00	-18.2	0.011	2.00
	9.997	10.01	-189.0	0.0096	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9662
- Serial No. : 991L0051

Dimension of probe;

- Length : 103 mm
- Diameter : 16 mm
- Immersion Depth : 90 mm

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
35.0	35.003	34.9	-0.103	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 %.

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a 119726



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO., LTD.
Address : 81 Sun Udonrak 41, Sukhumvit Road, Bangkok,
Pratunong, Bangkok 10260

Certificate No : 24-ACT-088
Request No : Req-2024-1366

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : SVANTEK
Model : SV 35
Serial Number : 44783
ID : UAE.EFM.019.2559
Class : 1
Range : 94 ~ 114 dB (100 Hz)
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ± 2 $^{\circ}\text{C}$)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 20 June 2024
Calibration Date : 25 June 2024

Location of Calibration : LAB 1 Acoustic

Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	IEC	12 June 2025
THD Multimeter	2015	1647265	NIST	16 January 2025

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibrated By : Mr. Noppadon Luangtari
Service Calibration Engineer

Approved By : Mr. Panti Mahavarn
Calibration Engineer Supervisor
Issue Date : 25 June 2024

The results related only to the items calibrated. This certificate shall be reproduced except in full, without written approval of the laboratory.
FM-2008-ACT-02 Rev.03 Issue date 5/6/24

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FM-2008-ACT-02 Rev.03 Issue date 5/6/24



Certificate No : 24-ACT-088

Request No : Req-2024-1366

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (\pm dB)	Acceptance limit Class 1 (\pm dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB - 1000 Hz	94.23	0.23	-	-	0.13	0.25	Pass
114 dB - 1000 Hz	114.22	0.22	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (\pm %)	Acceptance limit Class 1 (\pm %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB - 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass
114 dB - 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (\pm %)	Acceptance limit Class 1 (\pm %)	Result
	Measured (%)	Deviated (%)	Measured (%)	Deviated (%)			
94 dB - 1000 Hz	0.05	-	-	-	0.40	2.5	Pass
114 dB - 1000 Hz	0.09	-	-	-	0.40	2.5	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

* Acceptance limit max IEC 60942:2017 (class 1)

The calibration results exclude the calibration uncertainty extension

The calibration results exclude the microphone volume correction

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FM-2008-ACT-02 Rev.03 Issue date 5/6/24

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Certificate No : 24-ACT-088

Request No : Req-2024-1366

Decision Rule for Statements of Conformity

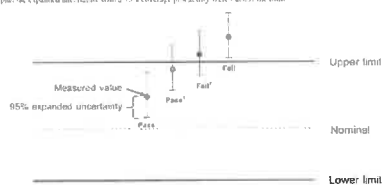
The standard decision rule applies to the statements of conformity in each calibration result will be applied to the IEC 60942:2017 (class 1) condition as the following:

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability, were within the limit.

Pass - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability, were outside the limit.



End of Calibration

เอกสารไม้ควบคุม
FM-2008-ACT-02 Rev.03 Issue date 5/6/24

เอกสารไม้ควบคุม
FM-2008-ACT-02 Rev.03 Issue date 5/6/24

Certificate of Calibration

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD
Name: 81 Soi Udonsook 41, Sukhumvit Road, Bangkok, Prakanong,
Address: Bangkok 10260
Certificate No: 24-AFM-010 Rev.1
Request No: Req-2023-2235

Unit Under Calibration Details

Measurement Item: Air Flow Meter
Manufacturer: TSI
Model: 4146
Serial Number: 41461922008
ID: UAFEFM12242562
Sensor Model: -
Sensor Serial Number: -
Location of Calibration: LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature: 23 °C ± 3 °C
Humidity: 55 %RH ± 20 %RH
Barometric Pressure: 1013 hPa ± 10 hPa
Received Date: 18 October 2023
Calibration Date: 23 January 2024

Calibration Procedure: In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18301010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU1651882	TPA	9 November 2024

Traceability:

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note:

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.
This Certificate was issued to replace to Calibration Certificate No. 24-AFM-010

Calibration By: Mr. Noppadon Luangant
Service Calibration Engineer

Approved By: Mr. Paei Mathayom
Calibration Engineer Supervisor
Issue Date: 24 January 2024

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The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-AFM-01 Rev.00 Issue date 01/07/19

Certificate No: 24-AFM-010 Rev.1
Request No: Req-2023-2235

Result of Calibration:

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Uncertainty (l/min)
24.40	101.19	0.020	0.020	0.000	0.0013
24.30	101.15	0.050	0.050	0.000	0.0033
24.40	101.13	0.059	0.100	0.091	0.0028
24.50	100.95	0.209	0.202	0.002	0.0066
24.60	100.91	0.501	0.500	-0.001	0.0074
26.60	100.96	0.994	1.000	0.006	0.015
24.50	100.90	1.691	1.701	0.010	0.025
24.60	100.92	1.597	2.011	0.014	0.029
26.60	101.20	2.593	3.020	0.027	0.042
24.50	101.20	4.019	4.000	-0.019	0.056
24.60	101.20	5.024	5.006	-0.018	0.070

Note

STD: Standard UUC: Unit Under Calibration

- UUC Reference Condition: At 21.1 °C, 101.3 kPa, Air

- Flow Rate was corrected for non-standard operating condition by using equation:

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

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FM-708-AFM-01 Rev.00 Issue date 01/07/19

Certificate of Calibration

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD
Name: 81 Soi Udonsook 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260
Address: Bangkok 10260
Certificate No: 24-ASP-075
Request No: Req-2024-1185

Unit Under Calibration Details

Measurement Item: Air Sampling Pump
Manufacturer: SENSIDYNE
Model: G-Flow 5
Serial Number: 2016102018
ID: UAFEFM1012561
Location of Calibration: LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature: 23 °C ± 3 °C
Humidity: 55 %RH ± 20 %RH
Barometric Pressure: 1013 hPa ± 10 hPa
Received Date: 4 June 2024
Calibration Date: 14 June 2024

Calibration Procedure: In-house method CP-ASP-01 based on ISO 13137 by Comparison With Standard Air Flow Meter

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Digital Thermometer with Probe	GT11	08000057	Qreborn	1 March 2024
Barometer	CPG2400	41000KDU1651882	TPA	9 November 2024

Traceability:

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note:

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %

Calibration By: Mr. Noppadon Luangant
Service Calibration Engineer

Approved By: Mr. Paei Mathayom
Calibration Engineer Supervisor
Issue Date: 14 June 2024

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FM-708-AFM-01 Rev.00 Issue date 01/07/19

Certificate No: 24-ASP-075
Request No: Req-2024-1185

Result of Calibration: HI

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Error (l/min, %)	**Allowable Range (l/min, %)	***Back Pressure (l/min, %)	Uncertainty (l/min)
24.50	99.16	1.010	1.000	-0.010	-1.1%	5 (1%)	5	0.016
24.50	96.62	0.555	1.000	0.042	4.4%	5 (1%)	15	0.015
24.50	92.80	0.953	1.000	0.047	4.9%	5 (1%)	30	0.015
24.50	99.05	1.718	1.700	-0.018	-1.1%	5 (1%)	5	0.028
24.50	96.60	1.674	1.700	0.026	1.6%	5 (1%)	15	0.027
24.50	92.74	1.647	1.700	0.053	3.1%	5 (1%)	30	0.026
25.00	99.14	2.019	2.000	-0.019	-0.9%	5 (1%)	5	0.029
25.00	96.55	2.005	2.000	-0.005	-0.2%	5 (1%)	15	0.030
25.00	92.84	1.972	2.000	0.028	1.4%	5 (1%)	30	0.029
24.80	99.09	2.508	2.500	-0.008	-0.3%	5 (1%)	5	0.040
24.80	96.60	2.465	2.500	0.035	1.4%	5 (1%)	15	0.040
24.80	92.76	2.460	2.500	0.040	1.6%	5 (1%)	30	0.040
24.50	99.01	3.021	3.000	-0.021	-0.7%	5 (1%)	5	0.048
24.40	96.59	3.022	3.000	-0.022	-0.7%	5 (1%)	15	0.048
24.50	94.04	3.035	3.000	-0.035	-1.2%	5 (1%)	25	0.048
24.40	99.11	4.010	4.000	-0.010	-0.2%	5 (1%)	5	0.064
24.40	97.83	4.060	4.000	-0.060	-1.5%	5 (1%)	10	0.064
24.40	95.28	4.159	4.000	-0.159	-3.8%	5 (1%)	20	0.064
24.40	99.04	5.027	5.000	-0.027	-0.5%	5 (1%)	5	0.079
24.40	97.69	5.171	5.000	-0.171	-3.3%	5 (1%)	10	0.081

Note

STD: Standard UUC: Unit Under Calibration

- UUC Reference Condition: At 25 °C, 101.3 kPa, Air

- Flow Rate was corrected for non-standard operating condition by using equation

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

Note

* Indicates non accredited

** Reference Specifications = 5% of set flow or ± 3 column whichever is higher

*** Specified in ISO 13137, Back Pressure control = 1 mH₂O

End of Certificate

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FM-708-AFM-01 Rev.00 Issue date 01/07/19



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3009-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24H753
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.1272550
Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 18 April 2024
Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments.

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Daw Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	ASA339	2311238	16 Oct 2024

2. The 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 maintained through:-

- Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0
- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by: Chakrit Weewwanjua
Issue Date: 18 April 2024

Approved Signatory:

[] Chakrit Weewwanjua
[x] Viporn Tanjyawutti
[] Unnopphol Harachai

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Cert. No.: 24H753
Page: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied
by coverage factor k = 2.00, providing confidence level approximately 95%

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3009-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24H756
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.1312550
Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 18 April 2024
Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments.

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Daw Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	ASA339	2311238	16 Oct 2024

2. The 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 maintained through:-

- Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0
- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by: Chakrit Weewwanjua
Issue Date: 18 April 2024

Approved Signatory:

[] Chakrit Weewwanjua
[x] Viporn Tanjyawutti
[] Unnopphol Harachai

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Cert. No.: 24H756
Page: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	44	3.9	1.6
25.0	60.0	61	1.0	1.7
25.0	80.0	76	-4.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.007	20.5	0.493	0.72
25.032	25.0	-0.032	0.72
29.997	30.0	0.003	0.72
35.010	34.5	-0.510	0.72
40.019	39.5	-0.519	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied
by coverage factor k = 2.00, providing confidence level approximately 95%

-00-

เอกสารไม่ควบคุม

Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING CONSULTANT
CO.,LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong,
Bangkok 10260

Certificate No : 24-LXM-051
Request No : Req-2024-0183
Page : 1/2

Unit Under Calibration Details

Instrument Name : Light Meter
Manufacturer : EXTECH
Model : 407026
Serial Number : A052267
Resolution : 1 lx
ID Number : UAE.EFM.115/2564
Range Calibration : 2000, 20000 lx
Instrument Status : Used


Calibration Environment and Details

Temperature : 25 °C ± 2 °C
Humidity : 60 %RH ± 20 %RH
Received Date : 26 January 2024
Calibrated Date : 29 February 2024
Calibration Procedure : The measurement was done in accordance with CP-LXM-01

Reference Standard : Photometer and Illuminance Sensor, Serial No.: 30662/2, 30592/2, which was calibrated on 31 October 2023,
Certificate No.: TP-1045-23

Traceability : This Certificate is traceable to International System of Unit (SI) Unit through National Institute of
Metrology (Thailand)

Note
The reported uncertainty is based on a standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence
approximately 95 %.

Approved By : 
Mr. Pachi Mathavorn
Calibration Engineer Supervisor
Issue Date : 13 May 2024

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The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-LXM-01 Rev.00 Issue date 01/07/19

Calibration Note
UUC Adjustment : Zero adjustment before use


Certificate No : 24-LXM-051
Request No : Req-2024-0183
Page : 2/2

Result of Calibration :

UUC Range (lx)	Standard (lx)	UUC Reading (lx)	Correction (lx)	Uncertainty (lx)
2000	10	0	0	0.0038
	50	50	0	2.2 % of Reading
	100	101	-1	2.2 % of Reading
	200	201	-1	2.2 % of Reading
	300	303	-3	2.2 % of Reading
	400	402	-2	2.2 % of Reading
	600	602	-2	2.2 % of Reading
	800	803	-3	2.2 % of Reading
	1000	1004	-4	2.2 % of Reading
	1200	1203	-3	2.2 % of Reading
	1400	1405	-5	2.2 % of Reading
	1600	1605	-5	2.2 % of Reading
	1800	1809	-9	2.2 % of Reading
	2000	1990	10	2.2 % of Reading
	3000	2980	20	2.2 % of Reading
20000	4000	3970	30	2.2 % of Reading
	5000	4930	50	2.2 % of Reading

* Indicates non accredited

End of Certificate

Calibrated By : 
Mr. Noppasak Luanng

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FM-708-LXM-01 Rev.00 Issue date 01/07/19

Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING CONSULTANT
CO.,LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong,
Bangkok 10260

Certificate No : 24-LXM-080
Request No : Req-2024-0538
Page : 1/2

Unit Under Calibration Details

Instrument Name : Light Meter
Manufacturer : EXTECH
Model : 407026
Serial Number : A056640
Resolution : 1 lx
ID Number : UAE.EFM.124/2565
Range Calibration : 2000, 20000 lx
Instrument Status : Used


Calibration Environment and Details

Temperature : 25 °C ± 2 °C
Humidity : 60 %RH ± 20 %RH
Received Date : 5 March 2024
Calibrated Date : 25 March 2024
Calibration Procedure : The measurement was done in accordance with CP-LXM-01

Reference Standard : Photometer and Illuminance Sensor, Serial No.: 30662/2, 30592/2, which was calibrated on 31 October 2023,
Certificate No.: TP-1045-23

Traceability : This Certificate is traceable to International System of Unit (SI) Unit through National Institute of
Metrology (Thailand)

Note
The reported uncertainty is based on a standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence
approximately 95 %.

Approved By : 
Mr. Pachi Mathavorn
Calibration Engineer Supervisor
Issue Date : 13 May 2024

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FM-708-LXM-01 Rev.00 Issue date 01/07/19

Calibration Note
UUC Adjustment : Zero adjustment before use

Certificate No : 24-LXM-080
Request No : Req-2024-0538
Page : 2/2

Result of Calibration :

UUC Range (lx)	Standard (lx)	UUC Reading (lx)	Correction (lx)	Uncertainty (lx)
2000	10	0	0	0.0038
	50	50	0	2.2 % of Reading
	100	101	-1	2.2 % of Reading
	200	200	0	2.2 % of Reading
	300	303	-3	2.2 % of Reading
	400	403	-3	2.2 % of Reading
	600	604	-4	2.2 % of Reading
	800	806	-6	2.2 % of Reading
	1000	1009	-9	2.2 % of Reading
	1200	1209	-9	2.2 % of Reading
	1400	1411	-11	2.2 % of Reading
	1600	1607	-7	2.2 % of Reading
	1800	1805	-5	2.2 % of Reading
	2000	1989	11	2.2 % of Reading
	3000	2980	20	2.2 % of Reading
20000	4000	3960	40	2.2 % of Reading
	5000	4930	50	2.2 % of Reading

* Indicates non accredited

End of Certificate

Calibrated By : 
Mr. Noppasak Luanng

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FM-708-LXM-01 Rev.00 Issue date 01/07/19

Certificate of Calibration

Customer
Name UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address 53 Soi Lomstak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260
Certificate No : 24-NDM-170
Request No : Req-2024-1469

Unit Under Calibration Details

Measurement item Noise Dosimeter
Manufacturer SVANTEK
Model SV 104
Serial Number 143229
ID QAF.FTM.147-2566
Resolution 0.1 dB
Microphone Class : 2
Microphone Model : SV27
Microphone S/N : 136867
Preamplifier Model :
Preamplifier S/N :
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH (± 20 %RH)
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 3 July 2024
Calibrated Date : 15 July 2024
Calibration Procedure : Indirect method CP-NUM-01 based on IEC 61252 : 2017
Location of Calibration Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Date calibration	Traceability
Multifrequency Calibrator	Quest	Qnc4-vol	EFA000234	25 July 2024	TSI
Standard Microphone	GRAS	40AN	188273	21 August 2024	GRAS
Sine Generator	Sinatok	Syam401	131	9 October 2024	WK Electric
Times	EXTECH		05-ACT	14 March 2025	TPA

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %

Calibrated By :
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :
Mr. Pich Mahavorn
Calibration Engineer Supervisor
Issue Date : 15 July 2024

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PM-NC-NDM-01 Rev. 03 Issue Date 5/6/24

Certificate No : 24-NDM-170
Request No : Req-2024-1469

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	
FAST / A / 55-140	Ref	UUC	Ref	UUC	Error		Limit	Result
Calibrator Setting	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	(%)	
1000 Hz 114 dB	120	120	3.17	3.13	-1.3	3.1	-21, +26	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY	Tolerances	Result
FAST / 55-140	A	C		Limit	
STD Setting	(dB)	(dB)	(± dB)	(± dB)	
63 Hz	-0.6	-0.1	0.40	2.0	Pass
125 Hz	-0.4	-0.2	0.40	1.5	Pass
250 Hz	-0.4	-0.3	0.40	1.5	Pass
500 Hz	-0.2	-0.1	0.40	1.5	Pass
1000 Hz	0.0	0.0	0.40	1.0	Pass
2000 Hz	0.1	0.1	0.40	2.0	Pass
4000 Hz	1.5	1.5	0.40	3.0	Pass
8000 Hz	+1.3	+1.1	0.40	5.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
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PM-NC-NDM-01 Rev. 03 Issue Date 5/6/24

Certificate No : 24-NDM-170
Request No : Req-2024-1469

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

U/C Setting		FAST / A / High									
1000 Hz	Ref	(dB)	55.9	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0
	Level A	(dB)	54.6	80.2	90.1	100.0	110.0	114.0	120.0	130.0	140.0
	Error	(dB)	0.8	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
8000 Hz	Ref	(dB)	88.9	98.9	108.9	112.9	118.9	128.9	138.9	148.9	158.9
	Level A	(dB)	88.9	98.9	108.9	112.9	118.9	128.9	138.9	148.9	158.9
	Error	(dB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63 Hz	Ref	(dB)	87.8	93.8	103.8	113.8	123.8	133.8	143.8	153.8	163.8
	Level A	(dB)	87.8	93.8	103.8	113.8	123.8	133.8	143.8	153.8	163.8
	Error	(dB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tolerances Limit		(±dB)	1.0								
UNCERTAINTY		(±dB)	0.3								
Result			Pass								

b. Sound exposure meter linearity of error

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 55-140	Ref	UUC	Ref	UUC	Error	(%)	Limit	
Calibrator Setting	(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(%)	(%)	(%)	
1000 Hz 110 dB	27	27	0.30	0.30	0.00	5.6	-21, +26	Pass
1000 Hz 110 dB	45	45	0.50	0.50	0.00			Pass
1000 Hz 110 dB	90	90	1.00	1.01	+1.00			Pass
1000 Hz 110 dB	180	180	2.00	2.02	+1.00			Pass
1000 Hz 120 dB	36	36	4.00	4.03	+0.75	Pass		
1000 Hz 120 dB	72	72	8.00	8.05	+0.63	Pass		
1000 Hz 120 dB	90	90	10.00	10.13	+1.30	Pass		
1000 Hz 120 dB	180	180	20.00	20.22	+1.10	5.6		Pass
1000 Hz 120 dB	360	360	40.00	40.34	+0.85		Pass	
1000 Hz 120 dB	720	720	80.00	80.49	+0.61		Pass	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
เอกสารไม่ควรถูก
PM-NC-NDM-01 Rev. 03 Issue Date 5/6/24

Certificate No : 24-NDM-170
Request No : Req-2024-1469

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 55-140	Ref	UUC	Ref	UUC	Error		Limit	
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	
4000 Hz 95 dB	2846	2846	1.00	1.00	0.00	0.052	-0.29 - -0.41	Pass

b. Sound exposure meter response for series of toneburst impulses

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 55-140	Ref	UUC	Ref	UUC	Error		Limit	
Calibrator Setting	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	(%)	
Burst 1 ms, 95 dB	2846	2846	1.00	1.00	0.00	5.6	-21 ~ +26	Pass
Burst 1 ms, 100 dB	900	900	1.00	1.00	0.00		-29 ~ +41	Pass
Burst 1 ms, 105 dB	143	143	1.00	1.01	+1.00		-29 ~ +41	Pass

5. Response to unipolar pulse

UUC Setting	Time	Exposure Measurement		UNCERTAINTY	Tolerances	Result
FAST / A / 55-140	UUC	UUC	Different		Limit	
Calibrator Setting	(s)	(Pa h) ²	(%)	(%)	(%)	
Continuous Rectangle +	29	10.37	0.00	3.7	-21, +26	Pass
Continuous Rectangle -		10.37				Pass

* Indicates non accredited

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
เอกสารไม่ควรถูก
PM-NC-NDM-01 Rev. 03 Issue Date 5/6/24

Certificate No : 24-NDM-170
Request No : Req-2024-1469

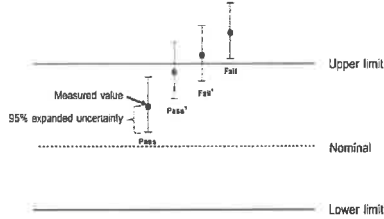
Decision Rule for Statements of Conformity

The standard deviation employed for the statements of conformity to each calibration result will be applied as follows: 1. 10% of the standard deviation of the measurement results plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass: The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail: The measurement result was not within the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail: The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.

เอกสารไม่ควบคุม

ISO 9001:2015 Rev. 01 Issue date 15/04/24

Certificate of Calibration

Customer

Name : UNITED ANAYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 24-NDM-172
Request No : Req-2024-1471

Unit Under Calibration Details

Measurement item	Noise Dosimeter	Microphone Class : 2
Manufacturer	SVANTEK	Microphone Model : SV27
Model	SV 104	Microphone S/N : 132054
Serial Number	143224	Preamplifier Model : -
ID	UAE-BM-142-2566	Preamplifier S/N : -
Resolution	0.1 dB	Instrument Status : Used
Calibration Environment and Details		
Temperature	23 °C ± 2 °C	
Humidity	50 % RH ± 20 % RH	
Barometric Pressure	1013 hPa ± 10 hPa	
Received Date	3 July 2024	
Calibrated Date	15 July 2024	
Calibration Procedure	In-house method CP-NDM-01 based on IEC 61252 : 2017	
Location of Calibration	Lab Acoustic	

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Multi-frequency Calibrator	Quest	Uncal	11-A000234	25 July 2024	TSI
Standard Microphone	GRAS	40AN	169273	21 August 2024	GRAS
Sine Generation	Svanick	Svan401	151	9 October 2024	WK Electric
Timer	EXTFC1		05-ACT	14 March 2025	IPA

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor (k = 2), providing a level of confidence approximately 95 %.

Calibrated By :

Mr. Nopphon Ungart
Service Calibration Engineer

Approved By :

Mr. Parit Mathavorn
Calibration Engineer Supervisor
Issue Date : 15 July 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.

เอกสารไม่ควบคุม

ISO 9001:2015 Rev. 01 Issue date 15/04/24

Certificate No : 24-NDM-172
Request No : Req-2024-1471

1. Absolute acoustical sensitivity

UCC Setting	Time	Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST : 55-140	Ref	UCC	Ref	UCC	Error	Limit	
Calibrator Setting:	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	
1000 Hz 114 dB	120	120	3.17	3.15	+1.3	±1	Pass

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, S/N: 58079.

2. Frequency weightings

UCC Setting	Deviation from various Frequency Weighting	UNCERTAINTY		Tolerances	Result
FAST : 55-140	A	C	(± dB)	(± dB)	
STD Setting	(dB)	(dB)			
63 Hz	0.1	0.4	0.40	2.0	Pass
125 Hz	0.2	0.4	0.40	1.5	Pass
250 Hz	-0.1	0.4	0.40	1.5	Pass
500 Hz	0.0	0.1	0.40	1.5	Pass
1000 Hz	0.0	0.0	0.40	1.5	Pass
2000 Hz	-0.2	-0.1	0.40	2.0	Pass
4000 Hz	2.6	2.6	0.40	3.0	Pass
8000 Hz	1.4	1.7	0.40	5.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.

เอกสารไม่ควบคุม

ISO 9001:2015 Rev. 01 Issue date 15/04/24

Certificate No : 24-NDM-172
Request No : Req-2024-1471

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UCC Setting	Time	Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST : A : 55-140	Ref	UCC	Ref	UCC	Error	Limit	
Calibrator Setting:	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	
1000 Hz 110 dB	27	27	0.30	0.30	0.00	±1.00	Pass
1000 Hz 110 dB	45	45	0.50	0.50	0.00	±1.00	Pass
1000 Hz 110 dB	90	90	1.00	1.01	+1.00	±1.00	Pass
1000 Hz 110 dB	180	180	2.00	2.02	+1.00	±1.00	Pass
1000 Hz 120 dB	36	36	4.00	4.03	+0.75	±1.00	Pass
1000 Hz 120 dB	72	72	8.00	8.05	+0.63	±1.00	Pass
1000 Hz 120 dB	90	90	10.00	9.99	-1.00	±1.00	Pass
1000 Hz 120 dB	180	180	20.00	19.76	-1.20	±1.00	Pass
1000 Hz 120 dB	360	360	40.00	40.34	+0.85	±1.00	Pass
1000 Hz 120 dB	720	720	80.00	80.49	+0.61	±1.00	Pass

b. Sound exposure meter linearity of error

UCC Setting	Time	Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST : A : 55-140	Ref	UCC	Ref	UCC	Error	Limit	
Calibrator Setting:	(s)	(s)	(Pa ² /h)	(Pa ² /h)	(%)	(%)	
1000 Hz 110 dB	27	27	0.30	0.30	0.00	±1.00	Pass
1000 Hz 110 dB	45	45	0.50	0.50	0.00	±1.00	Pass
1000 Hz 110 dB	90	90	1.00	1.01	+1.00	±1.00	Pass
1000 Hz 110 dB	180	180	2.00	2.02	+1.00	±1.00	Pass
1000 Hz 120 dB	36	36	4.00	4.03	+0.75	±1.00	Pass
1000 Hz 120 dB	72	72	8.00	8.05	+0.63	±1.00	Pass
1000 Hz 120 dB	90	90	10.00	9.99	-1.00	±1.00	Pass
1000 Hz 120 dB	180	180	20.00	19.76	-1.20	±1.00	Pass
1000 Hz 120 dB	360	360	40.00	40.34	+0.85	±1.00	Pass
1000 Hz 120 dB	720	720	80.00	80.49	+0.61	±1.00	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.

เอกสารไม่ควบคุม

ISO 9001:2015 Rev. 01 Issue date 15/04/24

Certificate No : 24-NIM-172
Request No : Req-2024-1471

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 55-140	Ref	UUC	Ref	UUC	Error	Limit		
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)		
-4000 Hz 95 dB	2846	2846	1.00	1.00	0.00	0.052	-0.29 ~ +0.41	Pass

b. Sound exposure meter response for series of toneburst impulses

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances	Result
FAST / A / 55-140	Ref	UUC	Ref	UUC	Error		Limit	
Calibrator Setting	(s)	(s)	(Pa h)	(Pa h)	(%)	(%)	(%)	
Burst 1 ms, 95 dB	2846	2846	1.00	1.00	0.00	5.6	-21 ~ +26	Pass
Burst 1 ms, 100 dB	900	900	1.00	1.00	0.00		-29 ~ +41	Pass
Burst 1 ms, 105 dB	143	143	1.00	1.01	+1.00		-29 ~ +41	Pass

5. Response to unipolar pulse

UUC Setting	Time	Exposure Measurement		UNCERTAINTY	Tolerances	Result
FAST / A / 55-140	UUC	UUC	Different		Limit	
Calibrator Setting	(s)	(Pa ² h)	(%)	(%)	(%)	
Continuous Rectangle *	29	10.37	0.00	3.7	-21 ~ +26	Pass
Continuous Rectangle *		10.37				Pass

* Indicates non accredited

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the head of the laboratory.

เอกสารไม่ควบคุม

Certificate No : 24-NIM-172
Request No : Req-2024-1471

Decision Rule for Statements of Conformity

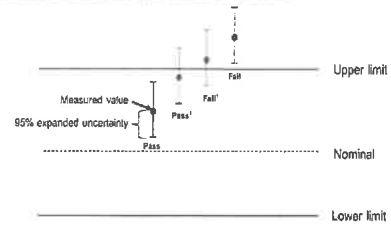
The certified laboratory complies with the requirements of conformity to each calibration result with the general rule (95% coverage) as follows:

Pass¹ : The measurement result plus the expanded uncertainty is less than 95% coverage probability is less than the limit.

Pass² : The measurement result is less than the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ : The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail² : The measurement result plus the expanded uncertainty is less than 95% coverage probability is less than the limit.



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the head of the laboratory.

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 BATTANAKARN ROAD SOI 18, SUKHUMDIANG, SUKHUMDIANG, BANGKOK 10250
TEL: 0-2717-3000-24 FAX: 0-2719-9484



Certificate of Calibration

Certificate No.: 24P1145
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Baigo

Model: 111MS

Serial No.: -

ID No.: UAE.EMA2.0672552

Condition As-Received: Used Item

Received Date: 03 April 2024

Calibration Date: 09 April 2024

Reference: 2404-0119WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

81 Soi Udomek 41, Sukhumvit Road, Bangkok,

Relative Humidity: (50 ± 15) %

Phrakhanong, Bangkok 10260

Atmospheric Pressure: 1007 mbar

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using * DKD-R 6-1 ; Calibration of Pressure Gauge * as a guideline.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3. This result of calibration was made on requested at the point specified by customer.

4. Scale and conversion factor is 1 kPa = 7.50062 mmHg

5. This result of calibration instrument was in absolute pressure.

6. This instrument was used clean air as pressure media.

7. The certificate is valid only to the item calibrated on date and place of calibration.

8. This Certification is traceable to the International System of Unit maintained through:-

- National Institute of Metrology Thailand (NIMT)

Calibrated by: Suksan Khankiew
Issue Date: 10 April 2024

Approved Signatory: [] Phalinee Prabpai
[] Sure Sornwong
[x] Attepai Penurach

เอกสารไม่ควบคุม



Cert.No.: 24P1145
Page: 2 of 2

Result of calibration: Without adjustment

Function: Absolute Pressure Measurement

Range: 720 mmHg to 780 mmHg

Scale Interval: 1 mmHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (mmHg)	717.66	725.00	739.73	750.27	761.74	773.61	786.17
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UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0
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Error (mmHg)	2.14	1.00	0.27	-0.27	-1.74	-3.61	-8.17
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Decreasing Pressure

Applied Pressure (mmHg)	786.17	773.15	760.92	749.39	738.50	727.85	717.77
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UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0
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Error (mmHg)	-6.17	-3.15	-0.92	0.61	1.50	2.35	2.23
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The uncertainty of measurement was ± 0.24 mmHg

* UUC = Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied

by a coverage factor A = 2, providing a level of confidence of approximately 95 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 24P1251
Page: 1 of 2

Equipment: U Tube Manometer

Manufacturer: Dwyer

Model: 1221-36-W/M

Serial No.:

ID No.: UAE.EFM.0772566

Condition As-Received: Used Item

Received Date: 03 April 2024

Calibration Date: 11 April 2024

Reference: 2404-0118WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1012 mbar

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.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guideline.

Condition of this result of calibration

1. Reference standards instruments

- | Instrument | Model | Serial No. | Certificate No. | Due Date |
|------------------------|--------|------------|-----------------|-------------|
| 1) Pressure Calibrator | PC106P | 1189 | MP-0176-23 | 12 Sep 2024 |
2. This result of calibration was made on requested at the point specified by customer.
3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O
4. This instrument was used clean air as pressure media.
5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.
6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.
7. The certificate is valid only to the item calibrated on date and place of calibration.
8. This Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by: Sukean Khankaew
Issue Date: 17 April 2024

Approved Signatory:

[] Phalinee Prebpaioel
[] Sura Suwanneer
[✓] Attapol Panurach

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Cert.No.: 24P1251
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Pressure Measurement

Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.05	-7.05	14.10	0.10
16.00	8.05	-8.05	16.10	0.10
18.00	9.05	-9.05	18.10	0.10
20.00	10.05	-10.05	20.10	0.10
22.00	11.05	-11.05	22.10	0.10
24.00	12.05	-12.05	24.10	0.10
26.00	13.05	-13.05	26.10	0.10
28.00	14.05	-14.05	28.10	0.10
30.00	15.05	-15.05	30.10	0.10
32.00	16.05	-16.10	32.15	0.15
34.00	17.05	-17.10	34.15	0.15
36.00	18.00	-18.00	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 24P1369
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model:

Serial No.:

ID No.: UAE.ANV.0132647

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guideline.

Condition of this result of calibration

1. Reference standards instruments

- | Instrument | Model | Serial No. | Certificate No. | Due Date |
|-----------------------|-------|------------|-----------------|-------------|
| 1) Standard Barometer | DPI42 | 1422505046 | MP-0094-23 | 03 May 2024 |
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.
3. This result of calibration was made on requested at the point specified by customer.
4. Scale and conversion factor is 1 kPa = 7.50062 mmHg
5. This result of calibration instrument was in absolute pressure.
6. This instrument was used clean air as pressure media.
7. The certificate is valid only to the item calibrated on date and place of calibration.
8. This Certification is traceable to the International System of Unit maintained through:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by: Sukean Khankaew
Issue Date: 23 April 2024

Approved Signatory:

[] Phalinee Prebpaioel
[] Sura Suwanneer
[✓] Attapol Panurach

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Cert.No.: 24P1369
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Increasing Pressure

Applied Pressure (mmHg)	718.40	729.71	740.61	751.07	761.97	773.05	786.81
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0
Error (mmHg)	1.60	0.29	-0.61	-1.07	-1.87	-3.05	-6.91

Decreasing Pressure

Applied Pressure (mmHg)	786.91	772.99	761.71	750.69	740.13	729.35	718.44
UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-6.91	-2.99	-1.71	-0.69	-0.13	0.65	1.56

The uncertainty of measurement was ± 0.24 mmHg

* UUC = Unit Under Calibration

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

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เอกสารไม่ควบคุม



Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING
Name : CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Prakanong, Bangkok 10260

Certificate No : 24-TPM-318
Request No : Req-2024-1557

Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Thermal Environment Monitor
Manufacturer : TSI QUEST
Model : QT-34
Serial Number : TEX040018
Resolution : 0.1 °C
ID Number : UAE.FPM.1.22-2566

Range Calibration : 20 °C to 60 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 10 July 2024
Calibrated Date : 16 July 2024

Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO-GINGO, Model: GT11/RTD100, SN: 03000057, ID: Q2-TPM Which was calibrated on 1 March 2024, Calibration Certificate No.: QR24-0478

Traceability

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSAC Accreditation No.: Calibration 0292

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

Approved By :
Mr. Noppadon Luangrat
Technical Manager
Issue Date : 16 July 2024

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of IIC. เอกสารนี้ควบคุม
P34-709-TPM-01 Rev.01 Issue Date 13/12/20



Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 24-TPM-318

Request No : Req-2024-1557

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	11V Reading (mV)	Conversion (°C)	Correction (± °C)
WET	20.030	20.0	0.0	0.13
	25.032	25.0	0.0	0.13
	30.034	29.9	-0.1	0.13
	35.037	35.0	0.0	0.13
	40.038	40.0	0.0	0.13
	45.040	44.9	-0.1	0.13
DRY	50.043	49.9	-0.1	0.13
	60.047	59.9	-0.1	0.13
	20.032	20.1	+0.1	0.13
	25.033	25.1	+0.1	0.13
	30.034	30.0	0.0	0.13
	35.036	35.1	+0.1	0.13
GLOBE	40.039	40.1	+0.1	0.13
	45.040	44.9	-0.1	0.13
	50.042	49.9	-0.1	0.13
	60.046	59.9	-0.1	0.13
	20.030	20.1	+0.1	0.13
	25.033	25.1	+0.1	0.13

End of Certificate

Calibrated By :
Mr. Suttichok Jirapolsakul

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of IIC. เอกสารนี้ควบคุม
P34-709-TPM-01 Rev.01 Issue Date 13/12/20



Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING
Name : CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Prakanong, Bangkok 10260

Certificate No : 24-TPM-323
Request No : Req-2024-1556

Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Thermal Environment Monitor
Manufacturer : TSI QUEST
Model : QT-34
Serial Number : TEX040012
Resolution : 0.1 °C
ID Number : UAE.FPM.116-2566

Range Calibration : 20 °C to 60 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 10 July 2024
Calibrated Date : 16 July 2024

Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO-GINGO, Model: GT11/RTD100, SN: 03000057, ID: Q2-TPM Which was calibrated on 1 March 2024, Calibration Certificate No.: QR24-0478

Traceability

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSAC Accreditation No.: Calibration 0292

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

Approved By :
Mr. Noppadon Luangrat
Technical Manager
Issue Date : 16 July 2024

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of IIC. เอกสารนี้ควบคุม
P34-709-TPM-01 Rev.01 Issue Date 13/12/20



Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 24-TPM-323

Request No : Req-2024-1556

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	11V Reading (mV)	Conversion (°C)	Correction (± °C)
WET	20.030	20.0	0.0	0.13
	25.033	25.0	0.0	0.13
	30.035	29.9	-0.1	0.13
	35.037	35.0	0.0	0.13
	40.038	39.9	-0.1	0.13
	45.040	44.9	-0.1	0.13
DRY	50.043	50.1	+0.1	0.13
	60.047	60.1	+0.1	0.13
	20.031	20.1	+0.1	0.13
	25.034	25.1	+0.1	0.13
	30.035	30.1	+0.1	0.13
	35.036	35.1	+0.1	0.13
GLOBE	40.039	40.0	0.0	0.13
	45.040	45.1	+0.1	0.13
	50.042	50.2	+0.2	0.13
	60.046	60.2	+0.2	0.13
	20.031	20.1	+0.1	0.13
	25.033	25.1	+0.1	0.13

End of Certificate

Calibrated By :
Mr. Suttichok Jirapolsakul

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of IIC. เอกสารนี้ควบคุม
P34-709-TPM-01 Rev.01 Issue Date 13/12/20

MULTI-POINT GAS TEST REPORT

Test Date : Nov 13, 2023

Equipment : Gas Analyzer (CO) **Model :** 48
Manufacturer : Thermo Scientific **Serial Number :** 1200636467

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94 PPM	Model :	1461
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8 PPM		
Cylinder No. :	EB0143252		
Expiration Date :	Jun 20, 2024		

Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.7	0.7	0.7
Level 2	20.00%	10.0	10.5	0.5	4.8
Level 3	40.00%	20.0	21.7	1.7	7.8
Level 4	60.00%	30.0	30.9	0.9	2.9
Level 5	80.00%	40.0	40.0	0.0	0.0
Remark : Measuring Range		50.0 ppm	Average Difference (%)		3.24
Acceptable Limit $\pm 5\%$					

Multi-Point Gas Test Chart

Calculate by: *[Signature]* 13/11/2023
Approve by: *[Signature]* 13/11/2023

Page 1 of 1

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Iranatelli Associates Co., Ltd.
61/14-15, 8/23-16
Pachayon 1, 1/1, 14, Phrasara, Bangkok
Bangkok 10260 (Thailand)
Tel: +662 680612
E-mail: irac@iranatelli.com
Web site: www.irac.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NISC 17015:17025
CALIBRATION 0367
Flow measurement laboratory
Calibration services department



CERTIFICATE OF CALIBRATION

Certificate No. : COF-002-66

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Office
MANUFACTURER : Andersen Instruments
MODEL/TYPE : G25A
SERIAL NUMBER : 1801
ID NUMBER : UAEANV/051/2547
CONDITION AS RECEIVED : Used Item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Calibration procedure:
The Office gas flow device was calibrated against Standard Rotary Displacement Meter (Scots Meter) Model 665/AMC/W2-5p. The W1-CL-004 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the VSL (National Metrology Institute of Netherlands) via Certificate number: G2211901

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM (Evaluation of measurement data - Guide to the expression of uncertainty in measurement)

RECEIVED DATE : 07 Jul 2023
MEASUREMENT DATE : 14 Jul 2023
ISSUE DATE : 18 Jul 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:
Temperature : 23.0 ± 0.1 °C
Relative Humidity : 55.0 ± 1.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions
Measurement Condition : The average values during measurement are 23.9 °C and 54.5%RH.

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:
The table on next page give the measured values.



Calibrated by:
1) Mr. Sorawit Thachulad
2) Miss Jiraporn Lamsongphol

Approved signatory: *[Signature]*
Mr. Panyia Booncharon
Calibration Department Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

เอกสารไม่ควบคุม



Continuation of Certificate of Calibration Number COF-002-66

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The Office gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Scots Meter). The humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m ³ /min	Pressure (Pa) mmHg	Temperature (°C)	Temperature (°F)	Δp_{meter} mmHg	Δp_{Office} mmHg	γ	Standard Flow [Q _s] m ³ /min
1	0.701	754.115	23.87	23.10	55.600	1.626	1.273	0.648
2	0.997	754.083	23.80	23.23	61.350	3.236	1.795	0.914
3	1.121	754.005	23.81	23.20	41.923	4.338	1.709	1.057
4	1.172	754.004	23.72	23.16	30.933	4.491	1.706	1.122
5	1.410	753.994	23.76	23.18	29.415	7.159	2.671	1.352

Slope [w]: 1.98463
Intercept [b]: -0.01693
Correlation coefficient (r): 0.99972
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure (Pa) mmHg	Temperature (°C)	Temperature (°F)	Δp_{meter} mmHg	Δp_{Office} mmHg	γ	Standard Flow [Q _s] m ³ /min
1	0.791	754.115	23.87	23.10	55.600	1.626	0.800	0.651
2	0.997	754.083	23.80	23.23	61.350	3.236	1.129	0.917
3	1.121	754.005	23.81	23.20	41.923	4.338	1.307	1.061
4	1.172	754.004	23.72	23.16	30.933	4.491	1.388	1.116
5	1.410	753.994	23.76	23.18	29.415	7.159	1.679	1.357

Slope [w]: 1.24306
Intercept [b]: -0.01029
Correlation coefficient (r): 0.99972
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



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Airgas Specialty Gases
Airgas USA LLC
601 Easton Road
Plumstead, PA 19049
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD.: E05N191E15A0014
Part Number: E80162121
Cylinder Number: 124 - Plumsteadville - PA
Laboratory: A12023
PGVP Number: CO, CO₂, NO, NO₂, SO₂, BALN
Gas Code: CO, CO₂, NO, NO₂, SO₂, BALN
Reference Number: 160-4027/2205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 680
Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2031

Certificates performed in accordance with "EPA Traceability Protocol for Assay and Certification of Reference Calibration Standards (May 2013)" document EPA 600/R-12/01, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a valid analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mass/volume basis unless otherwise noted. The results relate only to the item tested. The report shall not be reproduced, except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 6.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NO _x	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/27/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202309	CC754364	98.38 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	02219101	APF1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.82 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 28, 2031
PRM	12409	DB13660	15.00 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	15340022002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003820	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	236001	CC745902	246.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 02, 2028
NTRM	159508-02	CC011730	13.358 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

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

Instrument/Make/Model	Analytical Principle	Last Multi-Point Calibration
Nicolet 550 FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE N1-C8-180	NDIR	Jun 14, 2023
Nicolet 550 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet 550 FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicolet 550 FTIR AUP2010245 SO ₂	FTIR	Jun 06, 2023

Approved for Release

Page 1 of 1

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MULTI-POINT GAS TEST REPORT

Test Date : Nov 21, 2023

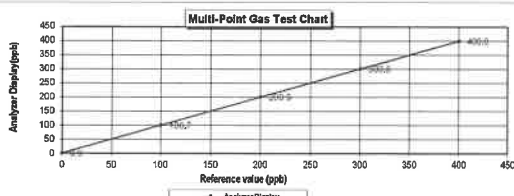
Equipment : Gas Analyser (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM22177051

Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.68 PPM
Nitric Oxide (NO) 45.94 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 984.8 PPM
Cylinder No. : EB0143262
Expiration Date : Jun 21 2024

Dilutor Detail
Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.90	0.90
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.9	0.90	0.45
Level 4	60.00%	300.0	300.8	0.80	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.46



Calculate by
Sathip
21 Nov 2023

Approve by
Sathip
22 Nov 2023

Page 1 of 1

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/41 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT BANGKOK 10260
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 24CH310
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA1M0043
ID No. : UAE.EFM.013/2565(EFM.pH.03/05)
Condition As-Received: Used item
Received Date : 12 March 2024
Calibration Date : 13 March 2024
Reference : 2403-0389WGC-3
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) °C
Relative Humidity : (50 \pm 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgagrakul

Approved by : Sathip
Approved Signatory

() Pornthipa Tameyakul
() Unnopphol Harachal
(x) Sathip Meangmal

Issue Date : 15 March 2024

The Uncertainties are for a confidence probability of approximately 95%

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A 0064527



Cert.No.: 24CH310
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	64030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	231908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.986	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage factor
pH Meter S/N.: HA1M0043	pH	mV	mV	pH	
	4.00	177.48	177.4	4.01	0.058
	7.00	0.00	-0.2	7.00	0.058
	7.00	0.00	-0.2	7.00	0.058
	10.00	-177.48	-177.6	10.01	0.058



Cert.No.: 24CH310
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (k)	Coverage factor
pH Electrode S/N.: Q92M0181	4.008	4.01	177.4	0.0079	2.00
	6.986	7.00	2.0	0.011	2.00
	8.988	7.00	1.5	0.011	2.00
	9.997	10.00	-171.3	0.0082	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652-10D
- Serial No. : Q92M0181
Dimension of probe
- Length : 103 mm.
- Diameter : 16 mm.
- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.002	35.0	-0.002	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 %.

-000-

Sathip
เอกสารไม่ควบคุม
a 1206337

Sathip
เอกสารไม่ควบคุม
a 1206338



United Analyst and Engineering Consultant Co., Ltd.
8 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : Nov 9, 2023

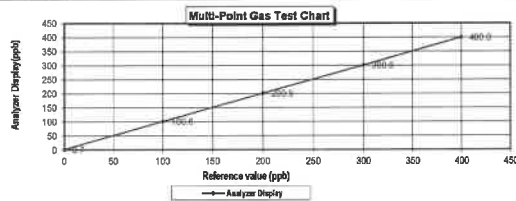
Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920015

Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.68 PPM
Nitric Oxide (NO) 45.94 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 984.8 PPM
Cylinder No. : EB0143262
Expiration Date : Jun 24, 2024

Dilutor Detail
Manufacturer : Thermo SCIENTIFIC
Model : 196i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70	0.70
Level 2	20.00%	100.0	100.6	0.60	0.60	0.60
Level 3	40.00%	200.0	200.9	0.90	0.45	0.45
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range 500.0 ppb				Average Difference (%) 0.40		



Calculate by
[Signature]
9 11 66

Approve by
[Signature]
9 Nov 2023

Page 1 of 1

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAO,
AMPHOE BANG PHU JAMU PRAKARN PROVINCE 1040 THAI AND
TEL: 0639-2116-5660-4 FAX: 0660-2116-7140



Page 1/2

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Certificate No : 23-AFM-219 Rev.1
Request No : Req-2023-2171

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : TSI
Model : 4146
Serial Number : 41461813030
ID : UAE.EFM.102/2561

Sensor Model : -

Sensor Serial Number : -

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 11 October 2023

Calibration Date : 25 October 2023

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 High flow	18501012012	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qtcorn	27 February 2024
Pressure meter	CPG2400	41000KDU651882	TPA	7 November 2023

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.B1

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.
This Certificate was issued to replace to Calibration Certificate No. 23-AFM-219

Calibration By : [Signature]
Mr. Noppidon Luangjai
Service Calibration Engineer

Approved By : [Signature]
Mr. Pasi Maitavorn
Calibration Engineer Supervisor
Issue Date : 7 November 2023

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Authority.
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FM-708-AFM-01 Rev.00 Issue date 01/07/19

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAO,
AMPHOE BANG PHU JAMU PRAKARN PROVINCE 1040 THAI AND
TEL: 0639-2116-5660-4 FAX: 0660-2116-7140



Certificate No : 23-AFM-219

Request No : Req-2023-2171

Result of Calibration :

Temperature (°C)	Pressure (kPa)	STD (µmin)	UUC (µmin)	Error (µmin)	Uncertainty (µmin)
25.00	101.20	0.018	0.020	0.002	0.0013
25.10	101.30	0.047	0.050	0.003	0.0033
25.20	101.27	0.096	0.100	0.004	0.0028
25.30	101.27	0.195	0.200	0.005	0.0026
25.30	101.27	0.493	0.500	0.007	0.0071
25.30	101.21	0.997	1.000	0.003	0.0083
25.20	101.20	1.688	1.696	0.010	0.0083
25.40	101.19	2.002	2.007	0.005	0.0046
25.30	101.15	2.991	3.014	0.023	0.0042
25.30	101.10	3.994	4.002	0.008	0.0056
25.30	101.10	5.032	5.009	0.023	0.0070

Note : STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At 21.1 °C, 101.3 kPa, Air
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates not accredited

End of Certificate

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The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Authority.
FM-708-AFM-01 Rev.00 Issue date 01/07/19



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18 SIYATHUANG, SUKHUMVIT 10259
TEL: 02-717-3600-24 FAX: 02-717-9381



Certificate of Calibration

Certificate No. : 24HT16
Page : 1 of 2

Equipment : Digital Thermo-hygrometer
Manufacturer : Digicon
Model : TH-02
Serial No. : 396034173
ID No. : UAE.EFM.102/2565

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

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 10 April 2024

Reference: 2406-0246WSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsak 41, Sukhumvit Road,
Bangkok, Phrakhanong, Bangkok 10260

Procedure used: Calibration was conducted using in-house calibration procedure CP-H03 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21655	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	ASAS39	231238	16 Oct 2024

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

3. This Certificate is traceable to the International System of Unit maintained through:-

- Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Viporn Tanjanyawuti
Issue Date : 17 April 2024

Approved Signatory : [Signature]
[] Chukrit Wanwanjue
[] Viporn Tanjanyawuti
[] Unwopphol Harnchal

เอกสารไม่ควบคุม

B 0339073



Cert. No.: 24H718
Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (%R.H.)
25.0	40.1	41	0.9	1.3
25.0	50.1	50	-0.1	1.6
25.0	60.0	58	-2.0	1.6
25.0	70.2	66	-4.2	1.6

Result of Calibration: Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (°C)
19.898	20.3	0.302	0.42
25.031	25.6	0.569	0.42
30.045	30.2	0.155	0.42
40.023	39.9	-0.123	0.42

UUC* : Unit Under Calibration
The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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a 1210371

Certificate of Calibration

Customer: UNITED ANALYSIS AND ENGINEERING CONSULTANT
Name: CO., LTD.
Address: 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Pratinong, Bangkok 10260

Certificate No.: 24-LXM-153
Request No.: Req-2024-1139
Page: 1-2

Unit Under Calibration Details

Instrument Name: Light Meter
Manufacturer: EXTECH
Model: 407026
Serial Number: A052262
Resolution: 1 lx
ID Number: UAE.EFM.174/2564

Range Calibration: 2000, 20000 lx
Instrument Status: Used

Calibration Environment and Details

Temperature: $25 \pm 0.2 \text{ }^{\circ}\text{C}$
Humidity: $60 \pm 20 \text{ \%RH}$
Received Date: 23 May 2024
Calibrated Date: 30 May 2024
Calibration Procedure: The measurement was done in accordance with CP-LXM-01

Reference Standard

Photometer and Illuminance Sensor, Serial No: 30662.7, 30592.2, which was calibrated on 31 October 2023.
Certificate No.: TP-1045-23

Traceability

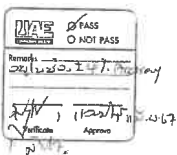
This Certificate is traceable to International System of Unit (SI) Unit through National Institute of Metrology (Thailand)

Note

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

Approved By:
Mr. Paet Mathavorn
Calibration Engineer Supervisor
Issue Date: 30 May 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory.
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ISM-708-1 XN-01 Rev 01 Issue date 01 07 19



Calibration No: 24-LXM-153
UUC Adjustment:
Request No.: Req-2024-1139
Page: 2-2

Result of Calibration :

UUC Range (lx)	Standard (lx)	UUC Reading (lx)	Correction (lx)	Uncertainty (lx)
2000	0	0	0	0.0055
	50	50	0	2.2 % of Reading
	100	100	0	2.2 % of Reading
	200	200	-1	2.2 % of Reading
	300	302	-2	2.2 % of Reading
	400	401	-4	2.2 % of Reading
	600	603	-3	2.2 % of Reading
	800	805	-5	2.2 % of Reading
	1000	1008	-8	2.2 % of Reading
	1200	1210	-10	2.2 % of Reading
	1400	1411	-11	2.2 % of Reading
	1600	1615	-15	2.2 % of Reading
	1800	1809	-9	2.2 % of Reading
	2000	1959	41	2.2 % of Reading
	3000	2980	20	2.2 % of Reading
	4000	3970	30	2.2 % of Reading
20000	5000	4990	50	2.2 % of Reading

* Indicates non-accredited

End of Certificate

Calibrated By:
Mr. Nopphon Luangtan

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ISM-708-1 XN-01 Rev 01 Issue date 01 07 19



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2717-3009-24 FAX: 0-2719-9484



Certificate of Calibration

Certificate No.: 24P1370
Page: 1 of 2

Equipment: Aneroid Barometer
Manufacturer: Barigo
Model: 111MS
Serial No.: -
ID No.: UAE.EMA2.065/2552
Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024
Reference: 2404-0243WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phra Khanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P10, using "DKD-R 6-1, Calibration of Pressure Gauges" as
a guidelines.

Condition of this result of calibration

1. Reference standards instruments

- | Instrument | Model | Serial No. | Certificate No. | Due Date |
|-----------------------|--------|------------|-----------------|-------------|
| 1) Standard Barometer | DPI142 | 1422505045 | NP-0094-23 | 03 May 2024 |
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.
3. This result of calibration was made on requested at the point specified by customer.
4. Scale and conversion factor is 1 kPa = 7.50062 mmHg
5. This result of calibration instrument was in absolute pressure.
6. This instrument was used clean air as pressure media.
7. The certificate is valid only to the item calibrated on date and place of calibration.
8. This Certification is traceable to the International System of Unit maintained through:-
- National Institute of Metrology Thailand (NIMT)

Calibrated by: Suisan Khankasaw
Issue Date: 23 April 2024

Approved Signatory:

[] Phallinee Prabpai
[] Sunn Suwanwasi
[✓] Atapol Panurech

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Cert.No.: 24P1370
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Range: 720 mmHg to 770 mmHg
Scale Interval: 1 mmHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (mmHg)	715.75	725.88	736.53	749.84	761.89	774.19
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0
Error (mmHg)	4.25	3.12	1.47	0.16	-1.99	-4.19

Decreasing Pressure

Applied Pressure (mmHg)	774.19	761.85	749.40	738.00	728.53	715.75
UUC* Indication (mmHg)	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-4.19	-1.85	0.60	2.00	3.47	4.25

The uncertainty of measurement was ± 0.24 mmHg

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2717-3009-24 FAX: 0-2719-9484



Cert.No.: 24CH240
Page: 1 of 3

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Horiba
Model: LAQUA-PH210
Serial No.: HA1M0036
ID No.: UAE.EFM.012/2555(EFM.pH.02/05)
Condition As-Received: Used Item
Received Date: 19 February 2024
Calibration Date: 20 February 2024
Reference: 2402-0594WSC-4
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road, Bangkok,
Phra Khanong, Bangkok 10260

Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In-house method;
- CP-CH5 by direct measurement with
DC Voltage Standard and direct measurement
with certified reference material (CRM)
- CP-CH5 by comparison with temperature standard

Calibrated by: Walak Sirithean

Approved by:
Approved Signatory

() Pomthippa Tameyakul
() Unnopphol Harachai
(✓) Sathip Meangmal

Issue Date: 22 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0063842



Cert.No.: 24CH240
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.996	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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 Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
			mV	pH		
pH Meter S/N: HA1M0036	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00

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a 1203290



Cert.No.: 24CH240
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: Q92M0181	4.008	4.01	177.8	0.0071	2.00
	6.986	6.99	2.5	0.0089	2.00
	6.986	6.98	1.8	0.0089	2.00
	9.897	10.00	-169.3	0.0085	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9925-10D

- Serial No. : Q92M0181

Dimension of probe

- Length : 107 mm.

- Diameter : 16 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.000	25.0	0.000	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	34.999	35.0	0.001	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 %.

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a 1203289

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, SOI 18 NTHAKORN 11 TAMBON BANG KAEU,
AMPHIBANG PHEI SAMUT PRAKAN PROVINCE 10440 THAILAND
TEL: 0609-2116-5808-1 FAX: 0609-2116-7140



Certificate of Calibration

Certificate No : 23-AFM-219 Rev.1

Request No : Req-2023-2171

Customer

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

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong,

Bangkok 10260

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : TSI

Model : 4146

Serial Number : 41461813030

ID : UAE.EFM.182/2561

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 11 October 2023

Calibration Date : 25 October 2023

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 High flow	18501012012	Sensidyne	12 July 2024
Temperature meter	QT II	08000057	Qeborn	27 February 2024
Pressure meter	CPG3400	4100KDL051882	TPA	7 November 2023

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

This Certificate was issued to replace to Calibration Certificate No. 23-AFM-219

Calibration By :

Mr. Noppadol Luangan

Service Calibration Engineer

Approved By :

Mr. Pachi Mahavorn

Calibration Engineer Supervisor

Issue Date : 7 November 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the head of Corporate Services 3. เอกสารไม่ควบคุม
FM-708-AFM-01 Rev.00 Issue date 01/07/19

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, SOI 18 NTHAKORN 11 TAMBON BANG KAEU,
AMPHIBANG PHEI SAMUT PRAKAN PROVINCE 10440 THAILAND
TEL: 0609-2116-5808-1 FAX: 0609-2116-7140



Certificate No : 23-AFM-219

Request No : Req-2023-2171

Result of Calibration :

Temperature (°C)	Pressure (kPa)	STD (1/min)	UUC (1/min)	Error (1/min)	Uncertainty (1/min)
25.00	101.20	0.618	0.620	0.002	0.0013
25.10	101.30	0.647	0.650	0.003	0.0033
25.20	101.27	0.696	0.100	0.004	0.0028
25.30	101.27	0.193	0.260	0.005	0.0056
25.30	101.27	0.493	0.500	0.007	0.0071
25.30	101.21	0.997	1.000	0.003	0.0083
25.20	101.20	1.688	1.698	0.010	0.0085
25.40	101.18	2.802	2.807	0.005	0.0086
25.30	101.10	2.991	3.014	0.023	0.042
25.30	101.10	3.994	4.062	0.068	0.056
25.30	101.10	5.037	5.069	-0.032	0.070

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At 21.1 °C, 101.3 kPa, Air

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

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FM-708-AFM-01 Rev.00 Issue date 01/07/19



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 16, SHANLUANG, SHANLUANG, BANGKOK 10211
TEL: 0-2715-3109-24 FAX: 0-2719-9384



Certificate of Calibration

Certificate No.: 24H716

Page: 1 of 2

Equipment : Digital Thermo-Hygrometer

Manufacturer : Digicon

Model : TH-02

Serial No.: 395034173

ID No.: UAE.EFM.182/2565

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 10 April 2024

to 11 April 2024

2404-0245WSC

Reference: (25 ± 3) °C

Ambient Temperature: (50 ± 20) %

Relative Humidity: 81 Soi Udomsak 41, Sukhumvit Road,

Bangkok, Phrakhanong, Bangkok 10260

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Procedure used: Calibration were conducted using in-house calibration procedure CP-H03 according to comparison

with standard chilled mirror sensor for humidity measurement function and comparison with standard

temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments :

Instrument Model Serial No. Certificate No. Due Date

1) Chilled Mirror Hygrometer Dew Master 44730 21856 02 Aug 2024

2) Handheld Thermometer With Sensor 1521 ASA339 231236 18 Oct 2024

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

3. This Certificate is traceable to the International System of Unit maintained through-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

-Technology Promotion Association (Thailand-Japan), NSQ-ONSC Accredited No. Calibration 0008

Calibrated by : Viporn Tanijawatt

Issue Date : 17 April 2024

Approved Signatory :

[] Chakrit Waeuwattana

[] Viporn Tanijawatt

[] Unnophol Harachai

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Cert. No.: 24H716
Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%RH)	UUC* Reading (%RH)	Error (%RH)	Uncertainty of Measurement (±%RH)
25.0	40.1	41	0.9	1.3
25.0	50.1	50	-0.1	1.8
25.0	60.0	58	-2.0	1.8
25.0	70.2	66	-4.2	1.8

Result of Calibration: Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
19.998	20.3	0.302	0.42
25.031	25.6	0.569	0.42
30.045	30.2	0.155	0.42
40.023	39.9	-0.123	0.42

UUC* Unit Under Calibration
The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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a 1210371

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
129/00013 WIRATWONGSITTHAMORN BANGKOK
AMPHIB RANGSIT INDUSTRIAL PARK, RANGSIT DISTRICT, BANGKOK
TEL : 06-062116-0900-1 FAX : 06-062116-7140



Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT
Name : C O J LTD
Address : 81 Soi Udonrak 41, Sukhumvit Road, Hangekok, Prakanong, Bangkok 10260
Certificate No : 24-LXM-153
Request No : Req-2024-1139
Page : 1 of 2

Unit Under Calibration Details

Instrument Name : Light Meter
Manufacturer : EXTECH
Model : 40702n
Serial Number : A052262
Resolution : 1 Lx
ID Number : 1 AE-EFM-174-2564
Range Calibration : 2000, 20000 Lx
Instrument Status : Used

Calibration Environment and Details

Temperature : $25 \pm 2^\circ\text{C}$
Humidity : $60 \pm 20\% \text{RH}$
Received Date : 23 May 2024
Calibrated Date : 30 May 2024
Calibration Procedure : The measurement was done in accordance with CP-LXM-01
Reference Standard : Photometer and Illuminance Sensor, Serial No. : 30662 2, 30592 2, which was calibrated on 31 October 2023.
Certificate No : TP-1045-23

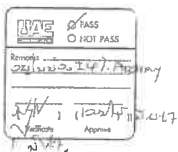
Traceability : This Certificate is traceable to International System of Unit (SI) Unit through National Institute of Metrology (Thailand)

Note

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

Approved By :
Mr. Pacit Mathayom
Calibration Engineer Supervisor
Issue Date : 30 May 2024

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The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
IAC-1708:1-XM-01 Rev.001, use date 01/06/19



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INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
129/00013 WIRATWONGSITTHAMORN BANGKOK
AMPHIB RANGSIT INDUSTRIAL PARK, RANGSIT DISTRICT, BANGKOK
TEL : 06-062116-0900-1 FAX : 06-062116-7140



Calibration Note : Certificate No : 24-LXM-153
UUC* Adjustment : Zero adjustment before use.
Request No : Req-2024-1139
Page : 2 of 2

Result of Calibration :

1 Lx Range (lx)	Standard (lx)	UUC* Reading (lx)	Correction (lx)	Uncertainty (± lx)
200	50	0	0	0.000
	50	50	0	2.2 % of Reading
	100	100	0	2.2 % of Reading
	200	201	-1	2.2 % of Reading
	300	302	-2	2.2 % of Reading
	400	404	-4	2.2 % of Reading
	600	603	-3	2.2 % of Reading
	800	805	-5	2.2 % of Reading
	1000	1006	-6	2.2 % of Reading
	1200	1210	-10	2.2 % of Reading
	1400	1411	-11	2.2 % of Reading
	1600	1615	-15	2.2 % of Reading
	1800	1809	-9	2.2 % of Reading
	2000	1999	11	2.2 % of Reading
2000	2000	2060	-60	2.2 % of Reading
	4000	3970	30	2.2 % of Reading
	5000	4950	50	2.2 % of Reading

* Indicates non-adjusted

End of Certificate

Calibrated By :
Mr. Nopphon Luangrat

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The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
IAC-1708:1-XM-01 Rev.001, use date 01/06/19



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24P1370
Page: 1 of 2

Equipment : Aneroid Barometer
Manufacturer : Berigo
Model : 111MS
Serial No. : -
ID No. : UAE.EMA2.085/2052

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.

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WBC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %

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

Atmospheric Pressure: 1007 mbar
Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guidelines.

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3. This result of calibration was made on requested at the point specified by customer.

4. Scale and conversion factor is 1 kPa = 7.50062 mmHg

5. This result of calibration instrument was in absolute pressure.

6. This instrument was used clean air as pressure media.

7. The certificate is valid only to the item calibrated on date and place of calibration.

8. This Certification is traceable to the International System of Unit maintained through:-

- National Institute of Metrology Thailand (NIMT)

Calibrated by : Sulaen Khankaew
Issue Date : 23 April 2024

Approved Signatory :

[] Phatinee Prebpaipol
[] Sum Suwanasri
[✓] Attapol Panuroch

เอกสารไม่ควบคุม



Cert.No.: 24P1370
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Range: 720 mmHg to 770 mmHg

Scale Interval: 1 mmHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (mmHg)	715.75	728.88	738.53	749.84	761.99	774.19
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0
Error (mmHg)	4.25	3.12	1.47	0.16	-1.99	-4.19

Decreasing Pressure

Applied Pressure (mmHg)	774.19	761.85	749.40	738.00	726.53	715.75
UUC* Indication (mmHg)	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-4.19	-1.85	0.60	2.00	3.47	4.25

The uncertainty of measurement was ± 0.24 mmHg

* UUC = Unit Under Calibration

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

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



Cert.No.: 24CH240
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA1M0038
ID No. : UAE.EFM.012/2565(EFM.pH.02/85)

Condition As-Received: Used Item

Received Date: 18 February 2024

Calibration Date: 20 February 2024

Reference: 2402-0594WSC-4

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

Ambient Temperature : (25 ± 2.5) °C

Relative Humidity : (50 ± 15) %

Calibration Procedure : In-house method :

- CP-CH5 by direct measurement with
DC Voltage Standard and direct measurement
with certified reference material (CRM)

- CP-CH8 by comparison with temperature standard

Calibrated by : Widadak Sirithuan

Approved by :

[] Pomsitippa Tanmyakul
[] Unnopphol Harachai
[✓] Sathip Meangmai

Issue Date : 22 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0063842



Cert.No.: 24CH240
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	64030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I008	26 July 2024

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

- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.868	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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 Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/NL: HA1M0038	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00

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a 1203290



Cert.No.: 24CH240
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (%)	Coverage factor k
pH Electrode S/N: Q92M0181	4.008	4.01	177.8	0.0071	2.00
	6.986	6.99	2.5	0.0099	2.00
	6.986	6.99	1.8	0.0099	2.00
	9.997	10.00	-169.3	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9825-10D

- Serial No. : Q92M0181

Dimension of probe

- Length : 107 mm.

- Diameter : 16 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.000	25.0	0.000	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	34.999	35.0	0.001	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 %.

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a 1203289



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534K PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-25 FAX. 0-2719-1484



Cert.No.: 24CH240
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA1M0036
ID No. : UAE.EFM.012/2565(EFM.pH.02/65)
Condition As-Received: Used Item
Received Date : 19 February 2024
Calibration Date : 20 February 2024
Reference : 2402-0564WSC-4
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
In - house method :
- CP-CH5 by direct measurement with
DC Voltage Standard and direct measurement
with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Watslak Sirithuan

Approved by :
Approved Signatory

() Pomsittha Tameyakul
() Unnopphol Harachul
(x) Saithip Meangmal

Issue Date : 22 February 2024

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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a 0063842



Cert.No.: 24CH240
Page: 2 of 3

Condition of this calibration result

- | Instrument | Serial No. | ID No. | Cert. No. | Due Date |
|--------------------------------|------------|----------|-----------|--------------|
| 1) Document Process Calibrator | 54030049 | 130RC116 | 23E2802 | 27 Aug 2024 |
| 2) Ref. Standard Thermometer | 4962054 | 110RC044 | 23I906 | 26 July 2024 |

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

- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1635

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.986	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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 Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N: HA1M0036	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00



Cert.No.: 24CH240
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (%)	Coverage factor k
pH Electrode S/N: Q92M0181	4.008	4.01	177.8	0.0071	2.00
	6.986	6.99	2.5	0.0099	2.00
	6.986	6.99	1.8	0.0099	2.00
	9.997	10.00	-169.3	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9825-10D

- Serial No. : Q92M0181

Dimension of probe

- Length : 107 mm.

- Diameter : 16 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.000	25.0	0.000	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	34.999	35.0	0.001	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 %.

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a 1203290

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a 1203289

Certificate of Calibration

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name: 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakaneng, Bangkok
Address: (0260)
Certificate No: 23-SLM-285
Request No: Req-2023-1652

Unit Under Calibration Details

Measurement Item: Sound Level Meter
Manufacturer: LARSON DAVIS
Model: LxT1
Serial Number: 0007304
ID: UALFEM-0372566
Resolution: 0.1 dB
Microphone Class: I
Microphone Model: 377B02
Microphone S/N: 345333
Preamplifier Model: PRMLxT1
Preamplifier S/N: 077639
Instrument Status: Used

Calibration Environment and Details

Temperature: 23 °C ± 2 °C
Humidity: 50 %RH ± 20 %RH
Barometric Pressure: 1013 hPa ± 10 hPa
Received Date: 7 August 2023
Calibrated Date: 29 August 2023
Calibration Procedure: In-house method CP-SLM-01 based on IEC 61672-1:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration: Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi-frequency Calibrator	Quana	Quest-cal	IFA100234	25 July 2024	TISI
Audio Generator	Svanick	Svan401	131	12 October 2023	WK Electric

Note

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

Calibrated By:
Mr. Noppadol Luangrat
Calibration Officer

Approved By:
Mr. Pait Muthavrom
Calibration Engineer Supervisor
Issue Date: 29 August 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
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334-708-SLM-01 Rev.0 Issue date 17/19

Certificate No: 23-SLM-285
Request No: Req-2023-1652

1. Indication at the calibration check frequency

UUC Setting	Measured	Before Adjust	After Adjust	UNCERTAINTY	Acceptance
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)
1000 Hz 114 dB	113.78	113.8	+0.02	113.9	+0.12
				(± dB)	Limit
				0.2	0.3

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTER, Model SV 35A, SN: 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	28.0	0.1

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	27.7	0.1
C	27.3	0.1
Z	31.6	0.1

4. Acoustic signal test of frequency weighting (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance
FAST / 37-139	A C Z	(± dB)	Limit
STD Setting	(dB) (dB) (dB)	(± dB)	(± dB)
125 Hz	0.0 0.1 0.1	0.6	1.0
1000 Hz	0.0 0.0 0.0	0.6	0.7
4000 Hz	0.1 0.2 0.2	0.6	1.0
8000 Hz	-0.4 -0.4 -0.3	0.7	+1.5 -1.5

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
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334-708-SLM-01 Rev.0 Issue date 17/19

Certificate No: 23-SLM-285
Request No: Req-2023-1652

5. Electrical signal test of frequency weighting, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance
FAST / 37-139	A (dB) C (dB) Z (dB)	(± dB)	Limit
STD Setting	(dB) (dB) (dB)	(± dB)	(± dB)
63 Hz	-0.2 -0.1 -0.1	0.2	1.0
125 Hz	-0.1 0.0 -0.1	0.2	1.0
250 Hz	-0.1 -0.1 -0.1	0.2	1.0
500 Hz	-0.1 0.0 0.0	0.2	1.0
1000 Hz	0.0 0.0 0.0	0.2	0.7
2000 Hz	0.0 0.0 0.0	0.2	1.0
4000 Hz	0.0 0.0 0.0	0.2	1.0
8000 Hz	-0.1 -0.1 0.0	0.2	-1.5, -2.5
16000 Hz	-0.1 -0.1 -0.1	0.2	+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / 37-139	REF	UUC	ERR	Limit
UUC Weighting	(dB)	(dB)	(dB)	(± dB)
A	114.00	114.0	0.0	0.2
C	114.00	114.0	0.0	0.2
Z	114.00	114.0	0.0	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
37-139 / A	REF	UUC	ERR	Limit
UUC Time Response	(dB)	(dB)	(dB)	(± dB)
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Log	114.00	114.0	0.0	0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
เอกสารไม่ควรถูก
334-708-SLM-01 Rev.0 Issue date 17/19

Certificate No: 23-SLM-285
Request No: Req-2023-1652

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	0.8
134.00	134	134.0	0.0	0.8
129.00	129	129.0	0.0	0.8
124.00	124	124.0	0.0	0.8
119.00	119	119.0	0.0	0.8
114.00	114	114.0	0.0	0.8
109.00	109	109.0	0.0	0.8
104.00	104	104.0	0.0	0.8
99.00	99	99.0	0.0	0.8
94.00	94	94.0	-0.1	0.8
89.00	89	89.0	-0.1	0.8
84.00	84	84.0	-0.1	0.8
79.00	79	79.0	-0.1	0.8
74.00	74	74.0	-0.1	0.8
69.00	69	69.0	-0.1	0.8
64.00	64	64.0	-0.1	0.8
59.00	59	59.0	-0.1	0.8
54.00	54	54.0	-0.1	0.8
49.00	49	49.0	0.0	0.8
44.00	44	44.1	0.1	0.8
39.00	39	39.2	0.2	0.8
34.00	34	34.4	0.4	0.8
29.00	29	29.4	0.4	0.8
24.00	24	24.6	0.6	1.8

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
เอกสารไม่ควรถูก
334-708-SLM-01 Rev.0 Issue date 17/19

Certificate No : 23-SLM-285
Request No : Req-2023-1652

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	41.3	41.6	0.3	0.8
	114	114.0	0.0	0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	135.0	0.0	0.5
	2	118.0	117.8	-0.2	+1.0, -1.5
	0.25	109.0	108.6	-0.4	+1.0, -3.0
Slow	200	128.6	128.5	-0.1	0.5
	2	109.0	108.9	-0.1	+1.0, -3.0
	0.25	109.0	109.0	0.0	0.5
SEL	200	129.0	129.0	0.0	+1.0, -1.5
	2	109.0	109.0	0.0	+1.0, -3.0
	0.25	100.0	99.8	-0.2	+1.0, -3.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	136.7	-0.70	2.0
Positive half cycle	136.4	136.2	-0.20	1.0
Negative half cycle	136.4	136.2	-0.20	1.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
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Certificate No : 23-SLM-285
Request No : Req-2023-1652

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	Limit	Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	141.8		
Negative one-half cycle	141.8		
Deviated	0.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	Limit	Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.1

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
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Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING
Name : CONSI TANT CO., LTD
Address : 81 Soi Udonsook 11, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 24-ACT-091
Request No : Req-2024-1389

Unit Under Calibration Details
Measurement item : Acoustic Calibrator
Manufacturer : SVANTEK
Model : SV 36
Serial Number : 107224
ID : UAEFM171 2564
Class : I
Range : 94 - 114 dB - 1000 Hz
Instrument Status : Used

Calibration Environment and Details
Temperature : (23 ± 2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 24 June 2024
Calibration Date : 26 June 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the International System of Units (SI).

Note
The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibrated By : Mr. Noppadon Luangart
Service Calibration Engineer
Approved By : Mr. Pachi Mathavorn
Calibration Engineer Supervisor
Issue Date : 26 June 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
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Certificate No : 24-ACT-091
Request No : Req-2024-1389

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)	Adjustment (dB)	Uncertainty (± dB)	Acceptance limit Class 1 (± dB)	Result
	Measured	Deviated value	Measured	Deviated value	
94 dB - 1000 Hz	94.02	0.02	0.14	0.25	Pass
114 dB - 1000 Hz	114.05	0.05	0.13	0.25	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated	
94 dB - 1000 Hz	1000.00	0.00	0.01	0.70	Pass
114 dB - 1000 Hz	1000.00	0.00	0.01	0.70	Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (%)	Measured (%)			
94 dB - 1000 Hz	0.34		0.40	2.5	Pass
114 dB - 1000 Hz	0.44		0.40	2.5	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20 %
Total distortion-noise	0.50 %

- Acceptance limit was IEC 60942:2017 Class 1
- The calibration results exclude the calibration pressure correction
- The calibration results exclude the microphone volume correction

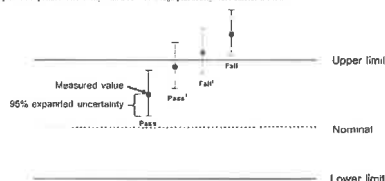
The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
เอกสารไม่ควบคุม

Certificate No. : 24-ACT-091
Request No. : Req-2024-1380

Decision Rule for Statements of Conformity

The standard decision rule employed for the statements of conformity for each calibration result will be applied using ILAC-G-19:2019 Guidelines on the Reporting of Conformance with Specifications as following Fig. and statements.

- Pass: The measurement result plus the expanded uncertainty with a 95% coverage probability, were within the limit.
- Fail: The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% is outside the limit.
- Fail: The measurement result plus the expanded uncertainty with a 95% coverage probability, were outside the limit.



End of Calibration

The result referred to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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FM-709-AC1-02 Rev-03 Issue date 5/6/24



Certificate of Calibration

Certificate No. : 24H753
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer : Beigo
Model : -
Serial No. : -
ID No. : UAE.ANV.127/2550
Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

61 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments.

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	2311238	16 Oct 2024

2. The 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 maintained through:-

- Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 2005932-0
- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Chakrit Wawwanjua
Issue Date : 18 April 2024

Approved Signatory :

[] Chakrit Wawwanjua
[✓] Viporn Tantayawuti
[] Unnopphol Hanchai

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Cert. No.: 24H753
Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration: Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

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Certificate of Calibration

Certificate No. : 24P1251
Page : 1 of 2

Equipment : U Tube Manometer
Manufacturer : Dwyer
Model : 1221-36-WM
Serial No. : -
ID No. : UAE.EFM.077/2566
Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 11 April 2024
Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (60 ± 15) %
Atmospheric Pressure: 1012 mbar

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.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udumsuk 41, Sukhumvit Road, Bangchak,
Phraekhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using * DKD-R 6-1, Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1. Reference standards instruments.

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	FC106P	1189	MP-0176-23	12 Sep 2024

2. This result of calibration was made on requested at the point specified by customer.

3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

4. This instrument was used clean air as pressure media.

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

7. The certificate is valid only to the item calibrated on date and place of calibration.

8. This Certification is traceable to the International System of Unit maintained through:-

- National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khenkaew
Issue Date : 17 April 2024

Approved Signatory :

[] Phullinee Pratsapaeil
[] Sura Suwannaasri
[✓] Attapol Panrach

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Cert.No.: 24P1251
Page: 2 of 2

Result of calibration: Without adjustment
Function: Pressure Measurement
Increasing Pressure

Range: 0 hPa to 35 hPa
Scale Interval: 0.1 hPa (The Second Estimate)

Applied Pressure	High-port side	Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.05	-7.05	14.10	0.10
16.00	8.05	-8.05	16.10	0.10
18.00	9.05	-9.05	18.10	0.10
20.00	10.05	-10.05	20.10	0.10
22.00	11.05	-11.05	22.10	0.10
24.00	12.05	-12.05	24.10	0.10
26.00	13.05	-13.05	26.10	0.10
28.00	14.05	-14.05	28.10	0.10
30.00	15.05	-15.05	30.10	0.10
32.00	16.05	-16.10	32.15	0.15
34.00	17.05	-17.10	34.15	0.15
35.00	18.00	-18.00	38.00	0.20

The uncertainty of measurement was ± 0.11 hPa

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PHITANAKARN ROAD SOI 18, SIUANLUANG, SIUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-31 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment: Aneroid Barometer
Manufacturer: Berigo

Model:
Serial No.:
ID No.: UAE ANV.1522550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

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.

81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10280

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 : Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1. Reference standards Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.				
3. This result of calibration was made on requested at the point specified by customer.				
4. This result of calibration instrument was in absolute pressure.				
5. This instrument was used clean air as pressure media.				
6. The certificate is valid only to the item calibrated on date and place of calibration.				
7. This Certification is traceable to the International System of Unit maintained through:- -National Institute of Metrology Thailand (NIMT)				

Calibrated by: Sukarn Khankeaw
Issue Date: 23 April 2024

Approved Signatory :
[] Phalinee Prabpaipal
[] Sura Suwannasri
[✓] Attapol Panurach

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Cert.No.: 24P1367
Page: 2 of 2

Result of calibration: Without adjustment
Function: Absolute Pressure Measurement

Range: 980 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.28	1011.35	1022.10	1032.91
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.58	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure	Applied Pressure (hPa)	1032.81	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0	
Error (hPa)		-2.81	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10280
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaec consultant.com E-mail: uaec@uaec consultant.com

MULTI-POINT GAS TEST REPORT

Test Date : Dec 18, 2023

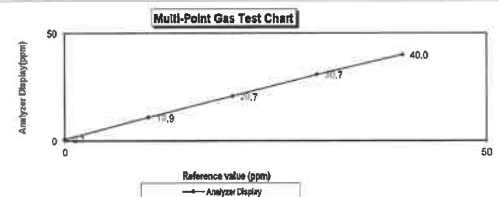
Equipment : Gas Analyzer (CO) Model : 48L
Manufacturer : Thermo Scientific Serial Number : 1182920020

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	1461
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8	PPM		
Cylinder No. :	EB0143262			
Expiration Date :	Jun 20, 2024			

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.7	0.7	0.7
Level 2 10.00%	10.9	0.9	8.3	8.3
Level 3 40.00%	20.0	0.7	3.4	3.4
Level 4 60.00%	30.0	0.7	2.3	2.3
Level 5 80.00%	40.0	0.0	0.0	0.0
Remark : Measuring Range	50.0 ppm	Average Difference (%)		2.92
:Acceptable Limit $\pm 5\%$				



Calculate by
Sukarn Khankeaw
18 Dec 2023

Approve by
Attapol Panurach
18 Dec 2023

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JIRANATTE ASSOCIATES CO., LTD.

Jirante Associate Co., Ltd.
62/14-15, 62/31-36
Fuchaiyuan 7/71, 62/31, Bangkok, Thailand 10260
Tel : +66(0)268612
Fax : +66(0)268613
E-mail : jirante@jirante.com
Web site : www.jirante.com

Accredited calibration laboratory
KQ/ACC 17025:2017
NSC TIS TIS 17025
CALIBRATION 0367

Flow measurement laboratory
Calibration services department



NSC - TIS - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CDF-002-66

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Lead Office
MANUFACTURER : Anderson Instruments
MODEL/TYPE : GISA
SERIAL NUMBER : 1801
ID NUMBER : UAE.AN.V.051/2547
CONDITION AS RECEIVED : Used item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 07 Jul 2023
MEASUREMENT DATE : 14 Jul 2023
ISSUE DATE : 15 Jul 2023

ENVIRONMENTAL CONDITIONS
Ambient condition in the laboratory are as follows:
Temperature : 23.9 ± 0.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION
Preconditioning : 24 hours at ambient conditions
Measurement Condition : The average values during measurement are 23.9 °C and 54.5%RH.

NOTES: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS
The table on next page give the measured values.

Calibration procedure
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Rods Meter) Model GISA/NAC/WC-0p. The WCL-004 was used as a calibration guideline.

Traceability
This certificate provides a traceability of the measurement to the realization of the International system of units (SI) through the VSL (National Metrology Institute of Netherlands) via Certificate number: 02211901

Uncertainty of Measurement
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM "Evaluation of measurement data - Guide to the expression of uncertainty in measurement"

Calibrated by:
□ Mr. Sorawit Thachad
□ Miss Pritaporn Lertsomphol



Approved signature: Mr. Pritaporn Lertsomphol
Calibration Department Manager

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THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY



JIRANATTE ASSOCIATES CO., LTD.

Continuation of Certificate of Calibration Number CDF-002-66

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Rods Meter). The humid air was used as a medium in the system. The standard conditions are 25 °C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m ³ /min	Pressure (Pa) mmHg	Temperature (T _a) °C	Temperature (T _m) °C	Ap_meter mmHg	Ap_Orifice mmHg	y	Standard Flow (Q _s) m ³ /min
1	0.701	754.115	23.87	23.30	55.600	1.626	1.273	0.648
2	0.997	754.083	23.89	23.23	61.350	2.225	1.795	0.917
3	1.121	754.005	23.81	23.20	61.923	4.338	2.079	1.061
4	1.172	754.004	23.72	23.16	30.933	4.891	2.208	1.126
5	1.410	753.994	23.76	23.18	29.415	7.159	2.571	1.357

Slope (a): 1.98463
Intercept (b): -0.01696
Correlation coefficient (r): 0.99972
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure (Pa) mmHg	Temperature (T _a) °C	Temperature (T _m) °C	Ap_meter mmHg	Ap_Orifice mmHg	y	Standard Flow (Q _s) m ³ /min
1	0.701	754.115	23.87	23.30	55.600	1.626	0.800	0.651
2	0.997	754.083	23.89	23.23	61.350	2.225	1.129	0.917
3	1.121	754.005	23.81	23.20	61.923	4.338	1.307	1.061
4	1.172	754.004	23.72	23.16	30.933	4.891	1.388	1.126
5	1.410	753.994	23.76	23.18	29.415	7.159	1.679	1.357

Slope (a): 1.24306
Intercept (b): 0.01029
Correlation coefficient (r): 0.99972
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



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an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
6141 Bastion Road
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND) LTD.
Part Number: EDSNB1E15A0014
Cylinder Number: E80182121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO, CO2, NO, NOX, SO2, BALN
Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 680
Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/031, using the assay procedure later. Analytical methodology does not require correction to analytical reference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder before 100 days, (a) 0.1% moisture.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	± 0.3% NIST Traceable	06/21/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	± 0.3% NIST Traceable	06/21/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	± 1.4% NIST Traceable	06/21/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	± 0.3% NIST Traceable	06/21/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	± 1.2% NIST Traceable	06/21/2023
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GAIS	104202308	C0754364	98.36 PPM NITRIC OXIDE/NITROGEN	± 0.4%	Jan 04, 2021
PRM	C2214901	AP01514048	100.19 PPM NITRIC OXIDE/NITROGEN	± 0.3%	Feb 28, 2025
GAIS	2023042525	C0754381	98.52 PPM NITRIC OXIDE/NITROGEN	± 0.4%	Apr 25, 2031
PRM	12408	D813659	15.01 PPM NITROGEN DIOXIDE/AIR	± 1.5%	Feb 17, 2023
GAIS	15340022002	E80180237	9.859 PPM NITROGEN DIOXIDE/NITROGEN	± 1.0%	Sep 29, 2025
NTRM	160102-22	KAL003020	97.69 PPM SULFUR DIOXIDE/NITROGEN	± 0.8%	Nov 01, 2027
CO	230601	C0745562	249.47 PPM CARBON MONOXIDE/NITROGEN	± 0.3%	Dec 09, 2028
NTRM	139505-02	CC411730	13.359 % CARBON DIOXIDE/NITROGEN	± 0.6%	May 14, 2025

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

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 16, 2023
SIEMENS ULTRAMATE N1-C8-180	NOIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023

Approved for Release

Page 1 of 1

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United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : Nov 1, 2023

Equipment: Gas Analyzer (NO₂)
Manufacturer: Thermo Scientific
Model: 42i
Serial Number: CH08130002

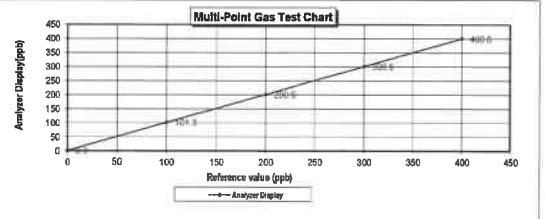
Standard Gas Concentration

Sulphur Dioxide (SO₂) : 44.68 PPM
Nitric Oxide (NO) : 45.94 PPM
Methane (CH₄) : -
Carbon Monoxide (CO) : 96.48 PPM
Cylinder No. : E80143262
Expiration Date : Jun 21, 2024

Dilutor Detail
Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.90	0.90	0.90
Level 2	20.00%	100.0	1.30	1.28	1.28
Level 3	40.00%	200.0	0.90	0.45	0.45
Level 4	60.00%	300.0	0.90	0.30	0.30
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range	500.0 ppb				
Acceptable Limit ± 5%					
Average Difference (%)					0.59



Calculate by

01 Nov 2023

Approve by

01 Nov 2023

Page 1 of 1

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CALIBRATION LABORATORY Co., LTD.

210-11, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.co.th E-mail: info@cal-lab.co.th



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14470/UM14470
CLID. NO. : 252000713
JOB CONTROL NO. : 230914102594

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHIUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 14 September 2023

DATE OF ISSUED : 19 September 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

[Signature]



Approved By : Mongkol Yotsoontorn
Authorized Signatory
19 September 2023

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23102594

F3-011-04/01-12

page 1 of 4

เอกสารไม่คว



calibration



CALIBRATION LABORATORY Co., LTD.

210-11, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.co.th E-mail: info@cal-lab.co.th



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14470/UM14470
DATE OF CALIBRATION : 15 September 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEX-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
2. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
3. Accelerometer with Conditioning Amplifier, Brüel & Kjær Model 8305, 2626 S/N. 705491, 1741406.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Astronomical Radio of Thailand Ltd. Certificate No. 07-004323, Due Date 03 April 2024.
2. The measurements are traceable to International System of Units (SI), through Astronomical Radio of Thailand Ltd. Certificate No. EE-00010-23, Due Date 27 March 2024.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0025-22, Due Date 12 October 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23102594

F3-011-04/01-12

page 2 of 4

เอกสารไม่คว



calibration



CALIBRATION LABORATORY Co., LTD.

210-11, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.co.th E-mail: info@cal-lab.co.th



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty \pm (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.402	-0.002	1.9
0.5	50 Hz		0.500	0.503	-0.003	1.3
0.6	50 Hz		0.600	0.604	-0.004	1.3
0.7	50 Hz		0.700	0.706	-0.006	1.3
0.3	100 Hz		0.300	0.302	-0.002	1.9
0.4	100 Hz	peak	0.400	0.404	-0.004	1.9
0.5	100 Hz		0.500	0.505	-0.005	1.3
0.6	100 Hz		0.600	0.607	-0.007	1.3
0.7	100 Hz		0.700	0.710	-0.010	1.3

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty \pm (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.043	-0.043	1.8
4	50 Hz		4.000	4.055	-0.055	1.8
5	50 Hz		5.000	5.068	-0.068	1.8
6	50 Hz		6.000	6.075	-0.075	1.8
7	50 Hz	peak	7.000	7.093	-0.093	1.8
3	100 Hz		3.000	3.041	-0.041	1.8
4	100 Hz		4.000	4.048	-0.048	1.8
5	100 Hz		5.000	5.079	-0.079	1.8
6	100 Hz		6.000	6.091	-0.091	1.8
7	100 Hz		7.000	7.123	-0.123	1.8

Certificate No. Q23102594

F3-011-04/01-12

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เอกสารไม่คว



calibration



CALIBRATION LABORATORY Co., LTD.

210-11, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-lab.co.th E-mail: info@cal-lab.co.th



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty \pm (% of rdg.)
(mm)	(frequency)					
*0.03	50 Hz	peak	0.030	0.030	0.000	2.1
*0.04	50 Hz		0.040	0.040	0.000	1.7
*0.05	50 Hz		0.050	0.050	0.000	1.5
*0.06	50 Hz		0.060	0.060	0.000	1.3
*0.07	50 Hz		0.070	0.071	-0.001	1.2
0.03	100 Hz		0.030	0.030	0.000	2.1
0.04	100 Hz	peak	0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.5
0.06	100 Hz		0.060	0.060	0.000	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

Note : * means Calibrations marked "Not ANAB Accredited" in this Certificate have been included for completeness.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 58

This report is valid for the above stated instrument's only.

End of Certificate

Certificate No. Q23102594

F3-011-04/01-12

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calibration

MULTI-POINT GAS TEST REPORT

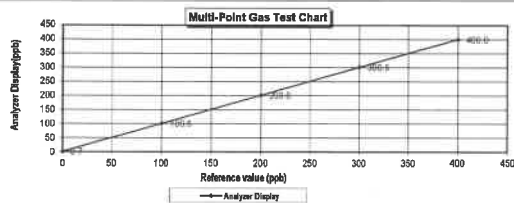
Test Date : Nov 9, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
 Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778115

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer : Thermo SCIENTIFIC
Nitric Oxide (NO)	45.94	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	984.8		
Cylinder No. :	EB0143262		
Expiration Date :	Jun 24, 2024		

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.7	0.70	0.70	0.70
Level 2	20.00%	100.0	100.6	0.60	0.60	0.60
Level 3	40.00%	200.0	200.8	0.80	0.40	0.40
Level 4	60.00%	300.0	300.9	0.90	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range 500.0 ppb			Average Difference (%)		0.40	



Calculate by
 Signature: *[Signature]*
 9 Nov 2023

Approve by
 Signature: *[Signature]*
 9 Nov 2023



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
 Address : 81 Soi Udomsak 41, Sukhumvit Road, Hangehak, Prakanong, Bangkok 10260

Certificate No : 24-ACT-091
 Request No : Req-2024-1380

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
 Manufacturer : SVANTEK Range : 94 - 114 dB / 1000 Hz
 Model : SV 36 Instrument Status : Used
 Serial Number : 107224
 ID : UAE.EFM.17.02564

Calibration Environment and Details

Temperature : (23 \pm 2 °C)
 Humidity : (50 \pm 20 %RH)
 Barometric Pressure : (1013 \pm 10.0 hPa)
 Received Date : 24 June 2024
 Calibration Date : 26 June 2024
 Location of Calibration : LAB 1 Acoustic
 Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

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

Calibrated By :

Mr. Noppadon Luangart
 Service Calibration Engineer

Approved By :

Mr. Pachi Mathavorn
 Calibration Engineer Supervisor

Issue Date : 26 June 2024



Certificate No : 24-ACT-091

Request No : Req-2024-1380

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	94.02	0.02	-	-	0.14	0.25	Pass
114 dB / 1000 Hz	114.05	0.05	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (%)	Measured (%)	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.24	-	-	-	0.40	2.5	Pass
114 dB / 1000 Hz	0.44	-	-	-	0.40	2.5	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion + noise	0.50%

- Acceptance limit was IEC 60942:2017 Class 1

- The calibration results exclude the calibration pressure correction

- The calibration results exclude the microphone volume correction



Certificate No : 24-ACT-091

Request No : Req-2024-1380

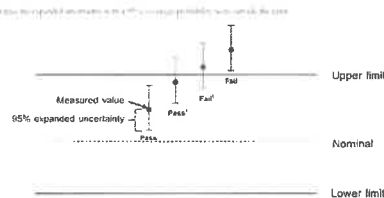
Decision Rule for Statements of Conformity

The measurement result plus the expanded uncertainty with a 95% coverage probability is within the limit.

Pass : The measurement result plus the expanded uncertainty with a 95% coverage probability is within the limit.

Fail : The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Pass : The measurement result plus the expanded uncertainty with a 95% coverage probability is within the limit.



End of Calibration



Certificate of Calibration

Certificate No.: 24H753
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Bango
Model: -
Serial No.: -
ID No.: UAE.ANV.1272550
Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 16 April 2024
Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phraekhong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024

2. The 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 maintained through:-
- Thunder Scientific Corporation, NV/LAB Accreditation No. Calibration 200582-0
- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by: Chakrit Wawwanjue
Issue Date: 16 April 2024

Approved Signatory:

[] Chakrit Wawwanjue
[x] Vipom Tanjanyawuli
[] Unnopphol Harschai

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Cert. No.: 24H753
Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Humidity Measurement.

Reference Temperature	Standard Humidity	UUC* Reading	Error	Uncertainty of Measurement
(°C)	(%R.H.)	(%R.H.)	(%R.H.)	(±%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.6

Result of Calibration: Without Adjustment
Function: Temperature Measurement.

Standard Temperature	UUC* Reading	Error	Uncertainty of Measurement
(°C)	(°C)	(°C)	(±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC*: Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied
by coverage factor k = 2.00, providing confidence level approximately 95%.

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Certificate of Calibration

Certificate No.: 24P1251
Page: 1 of 2

Equipment: U Tube Manometer
Manufacturer: Dwyer
Model: 1221-35-WIM
Serial No.: -
ID No.: UAE.EFM.0772596
Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 11 April 2024
Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1012 mbar

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsak 41, Sukhumvit Road, Bangchak,
Phraekhong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P04, using "DIX-R 6-1: Calibration of Pressure Gauges" as
a guideline.

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC105P	1188	MP-0176-23	12 Sep 2024

2. This result of calibration was made on requested at the point specified by customer.
3. Scale and conversion factor is 1 kPa = 4.0146289 inH₂O
4. This instrument was used clean air as pressure media.
5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.
6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.
7. The certificate is valid only to the item calibrated on date and place of calibration.
8. This Certification is traceable to the International System of Unit maintained through:-
- National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by: Sukwan Kwankeaw
Issue Date: 17 April 2024

Approved Signatory:

[] Phalinee Prabpalpal
[] Sura Sornnarn
[x] Attapol Panurach

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Cert. No.: 24P1251
Page: 2 of 2

Result of calibration: Without adjustment
Function: Pressure Measurement
Increasing Pressure

Range: 0 inH₂O to 36 inH₂O
Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC Indication	ΔP	Error
		Low-port side		
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.00	-7.00	14.10	0.10
16.00	8.00	-8.00	16.10	0.10
18.00	9.00	-9.00	18.10	0.10
20.00	10.00	-10.00	20.10	0.10
22.00	11.00	-11.00	22.10	0.10
24.00	12.00	-12.00	24.10	0.10
26.00	13.00	-13.00	26.10	0.10
28.00	14.00	-14.00	28.10	0.10
30.00	15.00	-15.00	30.10	0.10
32.00	16.00	-16.00	32.15	0.15
34.00	17.00	-17.00	34.15	0.15
36.00	18.00	-18.00	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL: 0-2719-3000-24 FAX: 0-2719-9481



Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE-ANV.162/2560

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udonsuk 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P10, using " DKD-R 6-1 : Calibration of Pressure Gauges " as
a guidelines.

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPH42	1422505048	MP-0064-23	03 May 2024

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3. This result of calibration was made on requested at the point specified by customer.

4. This result of calibration instrument was in absolute pressure.

5. This instrument was used clean air as pressure media.

6. The certificate is valid only to the item calibrated on date and place of calibration

7. This Calibration is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Sukson Khankaeew
Issue Date: 23 April 2024

Approved Signatory:

[] Phalinee Prabpaipal
[] Sura Suwanwasi
[x] Atapiol Panurach

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Cert No.: 24P1367
Page: 2 of 2

Result of calibration: Without adjustment

Function: Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa

Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.13	958.77	960.13	960.56	1001.25	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.25	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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JIRANATU ASSOCIATES CO., LTD.
1 Jiranutu Associates Co., Ltd.
63/14-15, 63/15-16
Pochakorn 7, 7/1, 84, Wongsaporn, Bangkok 10007 (Thailand)
Tel: +662-8806312
Mobile: +662-8806312
E-mail: jiranutu@jiranutu.com
Web site: www.jiranutu.com

Accredited calibration laboratory
RD/REC 17025:2017
NAC TIS TIS 17025
CALIBRATION 0367

Flow measurement Laboratory
Calibration services department



NSC - TIS - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No.: CDF-002-66

Page 1 of 2 Pages

MEASUREMENT ITEM: Tap Load Office
MANUFACTURER: Andersen Instruments
MODEL/TYPE: G25A
SERIAL NUMBER: 1501
ID NUMBER: UAE-ANV.051/2547
CONDITION AS-RECEIVED: Used Item
CUSTOMER: United Analyst and Engineering Consultant Co., Ltd.
81, Soi Udonsuk 41, Sukhumvit Road, Bangkok, Phraekhanong,
Bangkok 10260

RECEIVED DATE: 07 Jul 2023
MEASUREMENT DATE: 14 Jul 2023
ISSUE DATE: 18 Jul 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:
Temperature: 23.0 ± 0.6 °C
Relative Humidity: 55.0 ± 15.0 %RH
Atmospheric Pressure: 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning: 24 hours at ambient conditions.
Measurement Condition: The average values during measurement are 23.9 °C and 54.5%RH.

NOTE: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Office gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots
Meter) Model G65/AMC/N2-dp. The V0-CL-004
was used as a calibration guideline.

Traceability:

This certificate provides a traceability of the
measurement to recognized the national
standards, and to realization of the international
system of units [SI] through the VSL (National
Metrology Institute of Netherlands) via Certificate
number: G2212901

Uncertainty of Measurements:

The reported uncertainty of measurement is based
on the standard uncertainty multiplied by a
coverage factor $k=2$. Which for a normal
distribution corresponds to a coverage probability
of approximately 95%. The standard uncertainty
has been determined in accordance with the GUM
"Evaluation of measurement
data - Guide to the expression of uncertainty in
measurement"



Continuation of Certificate of Calibration Number CDF-002-66

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The Office gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25 °C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T _a] °C	Temperature [T _m] °C	Ap_meter mmHg	Ap_Office mmHg	Y	Standard Flow [Q _s] m ³ /min
1	0.701	754.115	23.87	23.10	55.600	1.626	1.223	0.648
2	0.997	754.053	23.80	23.23	61.350	3.236	1.795	0.914
3	1.121	754.005	23.81	23.20	41.923	4.338	2.079	1.057
4	1.172	754.004	23.72	23.16	30.933	4.891	2.208	1.122
5	1.410	753.994	23.76	23.18	29.435	7.159	2.671	1.352

Slope (a):

1.98463

Intercept (b):

-0.01835

Correlation coefficient (r):

0.99972

Uncertainty (k=2):

0.015 m³/min

Table 2: The results of P actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T _a] °C	Temperature [T _m] °C	Ap_meter mmHg	Ap_Office mmHg	Y	Standard Flow [Q _s] m ³ /min
1	0.701	754.115	23.87	23.10	55.600	1.626	0.800	0.651
2	0.997	754.053	23.80	23.23	61.350	3.236	1.129	0.917
3	1.121	754.005	23.81	23.20	41.923	4.338	1.307	1.061
4	1.172	754.004	23.72	23.16	30.933	4.891	1.388	1.126
5	1.410	753.994	23.76	23.18	29.435	7.159	1.679	1.357

Slope (a):

1.24306

Intercept (b):

-0.01028

Correlation coefficient (r):

0.99972

Uncertainty (k=2):

0.015 m³/min

End of Certificate of Calibration

Calibrated by:

☐ Mr. Sorawit Thachad
☒ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Sornchaisri
Calibration Department Manager

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IN WRITING FROM THE LABORATORY



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sai, Mueang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240324EA
Operation No.: CP2024080295

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.EFM.035/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260
Received Date: 9 August 2024
Calibrated Date: 22 - 27 August 2024
Issued Date: 28 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:
(Mr. Sittichai Swaksuriyawong)
Group Manager

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The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k)
providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except
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F-CAL-004 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.EFM.035/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787690	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PAS	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

3. This certification is traceable to the international system of unit maintained at :-

Reference standards Instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards Instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.6
C-weighting	28.4
Z-weighting	34.3

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.2	-0.2	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.0	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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F-CAL-005 Ed.1



Certificate No.: CP20240324EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.7	-0.3	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0; -3.0
	0.25	130.0	0.0	±0.5
LAE	2	110.0	0.0	+1.0; -1.5
	0.25	100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0



Certificate No.: CP20240324EA

Calibration Report

Function : 10. Overload Indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.6	143.4	-0.2	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload Indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --



CALIBRATION LABORATORY Co., LTD.

875/11-14, 38-39, Phrasaeng Subong Road, Phrasaeng Subong, Bangkok 10260
Tel: 02-016-0334 P. Fax: 02-016-0335 E: info@clc.co.th Website: www.clc.co.th



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11355/UM11355 [UAE.EFM.002/2560]
CLID. NO. : 252000637
JOB CONTROL NO. : 240608059622
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHAONG, BANGKOK 10260

DATE OF RECEIVED : 08 June 2024

DATE OF ISSUED : 12 June 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsontorn
Authorized Signatory
12 June 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24059622

F3-011-05/12-23



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CALIBRATION LABORATORY Co., LTD.

875/11-14, 38-39, Phrasaeng Subong Road, Phrasaeng Subong, Bangkok 10260
Tel: 02-016-0334 P. Fax: 02-016-0335 E: info@clc.co.th Website: www.clc.co.th



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11355/UM11355 [UAE.EFM.002/2560]
DATE OF CALIBRATION : 11 June 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter,
Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 20320.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SN607101.
- Accelerometer with Measuring Amplifier, Brüel & Kjær Model 8305, 2525 S/N. 397018, 2434958.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-016-23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050-24, Due Date 13 May 2025.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AN-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24059622

F3-011-05/12-23



Page 2 of 4



CALIBRATION LABORATORY CO., LTD.

210-11, 4/55 Soi Prasert Manuak 29 Yaek 4, Prasert Manuak Rd. Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cclablab.com E-mail: info@cclablab.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point (g) (frequency)	Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
0.3 50 Hz	peak	0.300	0.298	+0.002	1.9
0.4 50 Hz		0.400	0.397	+0.003	1.6
0.5 50 Hz		0.500	0.496	+0.004	1.6
0.6 50 Hz		0.600	0.594	+0.006	2.5
0.7 50 Hz		0.700	0.693	+0.007	2.5
0.3 100 Hz		0.300	0.301	-0.001	1.9
0.4 100 Hz		0.400	0.399	+0.001	1.6
0.5 100 Hz	peak	0.500	0.497	+0.003	1.6
0.6 100 Hz		0.600	0.596	+0.004	2.5
0.7 100 Hz		0.700	0.696	+0.004	2.5

2. VELOCITY RESULT

Test point (mm/s) (frequency)	Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
3 50 Hz	peak	3.000	3.013	-0.013	1.8
4 50 Hz		4.000	4.028	-0.028	1.8
5 50 Hz		5.000	5.036	-0.036	1.8
6 50 Hz		6.000	6.039	-0.039	1.8
7 50 Hz		7.000	7.048	-0.048	1.8
3 100 Hz		3.000	3.014	-0.014	1.6
4 100 Hz		4.000	4.021	-0.021	1.6
5 100 Hz	peak	5.000	5.029	-0.029	1.6
6 100 Hz		6.000	6.032	-0.032	1.5
7 100 Hz		7.000	7.038	-0.038	1.5

Certificate No. Q24059622

F3-011-05/12-23

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CALIBRATION LABORATORY CO., LTD.

210-11, 4/55 Soi Prasert Manuak 29 Yaek 4, Prasert Manuak Rd. Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cclablab.com E-mail: info@cclablab.com



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point (mm) (frequency)	Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
0.03 50 Hz	peak	0.030	0.030	0.000	2.5
0.04 50 Hz		0.040	0.040	0.000	2.1
0.05 50 Hz		0.050	0.050	0.000	1.9
0.06 50 Hz		0.060	0.059	+0.001	1.8
0.07 50 Hz		0.070	0.069	+0.001	1.8
0.03 100 Hz		0.030	0.030	0.000	2.5
0.04 100 Hz		0.040	0.040	0.000	2.1
0.05 100 Hz	peak	0.050	0.050	0.000	1.9
0.06 100 Hz		0.060	0.059	+0.001	1.8
0.07 100 Hz		0.070	0.069	+0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1 2 of 67

* means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

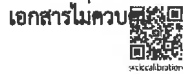
This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24059622

F3-011-05/12-23

page 4 of 4



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
3544 PATTASAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9434



Cert.No.: 24CH40
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA9M0048
ID No. : UAE.EFM.001/2583(EFM.pH.01/03)
Condition As-Received: Used Item
Received Date : 09 January 2024
Calibration Date : 10 January 2024
Reference : 2401-0219WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemagatrakul

Approved by :
Approved Signatory

(✓) Seithip Meangmal
() Warakorn Lemagatrakul
() Ponpan Palpin

Issue Date : 16 January 2024

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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Cert.No.: 24CH40
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4892054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.986	CPA chem	831959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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	Coverage factor
pH Meter S/N.: HA9M0046	pH	mV	mV	(mV)	k
	4.00	177.48	177.5	0.058	2.00
	7.00	0.00	0.2	0.058	2.00
	7.00	0.00	0.2	0.058	2.00
	10.00	-177.48	-177.0	0.058	2.00

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Cert.No.: 24CH40
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N: -	4.008	4.01	171.9	0.0079	2.00
	6.986	6.99	-2.2	0.0093	2.00
	6.986	6.99	-3.6	0.0093	2.00
	9.997	10.01	-171.0	0.011	2.07

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -
- Serial No. : -
Dimension of probe;
- Length : 103 mm
- Diameter : 16 mm
- Immersion Depth : 90 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
35.0	35.003	35.0	-0.003	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 %.

-00-

Signature

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Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Pratunong, Bangkok 10260

Certificate No : 24-ACT-091
Request No : Req-2024-1380

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : SVANTEK
Model : SV 36
Serial Number : 107224
ID : UAE.FFM.171/2564
Class : 1
Range : 94, 114 dB / 1030 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 \pm 2 °C)
Humidity : (50 \pm 20 %RH)
Barometric Pressure : (1013 \pm 10.0 hPa)
Received Date : 24 June 2024
Calibration Date : 26 June 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibrated By : Mr. Noppadon Luangnan
Service Calibration Engineer

Approved By : Mr. Puchi Mathavorn
Calibration Engineer Supervisor
Issue Date : 26 June 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full without written approval of the body.
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FM 708 ACT-01 Rev 03 Issue date 5/6/24



Certificate No : 24-ACT-091
Request No : Req-2024-1380

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (\pm dB)	Acceptance limit Class I (\pm dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	94.02	0.02	-	-	0.14	0.25	Pass
114 dB / 1000 Hz	114.05	0.05	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (\pm %)	Acceptance limit Class I (\pm %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (\pm %)	Acceptance limit Class I (\pm %)	Result
	Measured (%)	Measured (%)	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.24	-	-	-	0.40	2.5	Pass
114 dB / 1000 Hz	0.44	-	-	-	0.40	2.5	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.30%
Total distortion+noise	0.50%

- Acceptance limit was IEC 60942:2017 Class 1
- The calibration results exclude the calibration pressure correction
- The calibration results exclude the microphone volume correction

The results related only to the item calibrated. The certificate shall not be reproduced except in full without written approval of the body.
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FM 708 ACT-01 Rev 03 Issue date 5/6/24



Certificate No : 24-ACT-091
Request No : Req-2024-1380

Decision Rule for Statements of Conformity

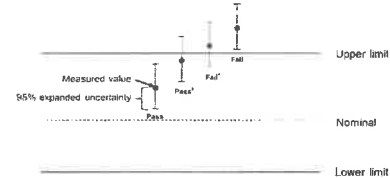
The measurement results shall be compared with the acceptance limit. If the measurement result is within the acceptance limit, the measurement result is considered to be in conformity with the specification. If the measurement result is outside the acceptance limit, the measurement result is considered to be non-conforming with the specification.

Pass - The measurement result is within the acceptance limit. The measurement result is considered to be in conformity with the specification.

Fail - The measurement result is outside the acceptance limit. The measurement result is considered to be non-conforming with the specification.

Fail - The measurement result is outside the acceptance limit. The measurement result is considered to be non-conforming with the specification.

Fail - The measurement result is outside the acceptance limit. The measurement result is considered to be non-conforming with the specification.



End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full without written approval of the body.
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FM 708 ACT-01 Rev 03 Issue date 5/6/24



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, RUANGJIAN, RUANGJIAN, BANGKOK 10250
TEL. 0-2717-9000-24 FAX. 0-2719-9484



NAC THE THAI
CALIBRATION 1005

Certificate of Calibration

Certificate No. : 24P1367
Page : 1 of 2

Equipment : Aneroid Barometer

Manufacturer : Bergho

Model : 1

Serial No. : 1

ID No. : UAE.ANV.152/2550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Phrakhanong Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guideline.

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505048	MP-0094-23	03 May 2024

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3. This result of calibration was made on requested at the point specified by customer.

4. This result of calibration instrument was in absolute pressure.

5. This instrument was used clean air as pressure media.

6. The certificate is valid only to the item calibrated on date and place of calibration

7. This Calibration is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Sukken Kiatkaew
Issue Date : 23 April 2024

Approved Signatory :

[] Phaisoon Pradpalai

[] Sura Suwanneesi

[✓] Atteporn Panurach

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Cal.No.: 24P1367
Page: 2 of 2

Result of calibration - Without adjustment

Function: Absolute Pressure Measurement

Range: 980 hPa to 1030 hPa

Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.13	968.77	980.13	990.58	1001.26	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.67	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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J NAC
J NAC ASSOCIATES CO., LTD.
63/14-15, 62/13-16
Pattana Park 7/12, 16 Westparks, Bangkok yai,
Bangkok 10260 (Thailand)
Tel: +66(0)260612
Mobile: +66(0)260612
E-mail: jnac-ca@jnac.co.th
Web site: www.jnac.co.th

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TIS-TIS 17025
CALIBRATION 0367



NSC - TIS - TIS 17025
CALIBRATION 0367

Flow measurement laboratory
Calibration services department

CERTIFICATE OF CALIBRATION

Certificate No. : COF-002-66

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER : Top Lead Office

MODEL TYPE : Andersen Instruments

SERIAL NUMBER : 035A

ID NUMBER : 13901

CONDITION AS-RECEIVED : UAE.ANV.051/2547

CUSTOMER : Used Item

United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong,

Bangkok 10260

RECEIVED DATE : 07 Jul 2023

MEASUREMENT DATE : 14 Jul 2023

ISSUE DATE : 18 Jul 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 0.0 °C

Relative Humidity : 55.0 ± 15.0 %RH

Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions

Measurement Condition : The average values during measurement are 23.9 °C and 54.5%RH.

NOTE: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Office gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots
Meter) Model G55/PM2-dp. The WH-CL-004
was used as a calibration guideline.

Traceability:

This certificate provides a traceability of the
measurement to recognized the national
standards, and to realization of the international
system of units (SI) through the NAC (National
Metrology Institute of Netherlands) via Certificate
number: G2211901

Uncertainty of Measurement:

The reported uncertainty of measurement is based
on the standard uncertainty multiplied by a
coverage factor $k=2$. Which for a normal
distribution corresponds to a coverage probability
of approximately 95%. The standard uncertainty
has been determined in accordance with the GUM
Evaluation of measurement
data - Guide to the expression of uncertainty in
measurement



JIRANITTE ASSOCIATES CO., LTD.

Continuation of Certificate of Calibration Number COF-002-66

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The Office gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The humid air was used as a
medium in the system. The standard conditions are 25 °C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of (1) Standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Office mmHg	r	Standard Flow [Qs] m ³ /min
1	0.701	754.115	23.87	23.10	55.600	1.626	1.273	0.648
2	0.997	754.083	23.80	23.23	61.350	3.236	1.795	0.914
3	1.121	754.005	23.81	23.20	41.923	4.338	2.070	1.057
4	1.172	754.004	23.72	23.16	30.933	4.891	2.208	1.122
5	1.410	753.994	23.76	23.18	29.415	7.159	2.671	1.352

Slope (m): 1.94663

Intercept (b): -0.01636

Correlation coefficient (r): 0.99972

Uncertainty (k=2): 0.015 m³/min

Table 2: The results of (2) actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Office mmHg	r	Standard Flow [Qs] m ³ /min
1	0.701	754.115	23.87	23.10	55.600	1.626	0.800	0.651
2	0.997	754.083	23.80	23.23	61.350	3.236	1.120	0.917
3	1.121	754.005	23.81	23.20	41.923	4.338	1.307	1.061
4	1.172	754.004	23.72	23.16	30.933	4.891	1.388	1.126
5	1.410	753.994	23.76	23.18	29.415	7.159	1.879	1.357

Slope (m): 1.24306

Intercept (b): -0.01029

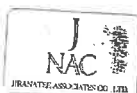
Correlation coefficient (r): 0.99972

Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration

Calibrated by:

Mr. Sorawit Thachalad
Ms. Jitraporn Lersangphol



Approved signatory:

Mr. Panyo Boonchazon
Calibration Department Manager

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THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED
IN WRITING FROM THE LABORATORY

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Certificate No.: CP20240324EA
Operation No.: CP2024080295

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377802 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.EFM.035/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260
Received Date: 9 August 2024
Calibrated Date: 22 - 27 August 2024
Issued Date: 28 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k)
providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except
with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Page 1 of 6

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F-CAL-004 Ed.1



Certificate No.: CP20240324EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377802 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.EFM.035/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multi-meter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023	24 March 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030	11 April 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB	13 February 2025
			CK20230072EA	13 September 2024

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

3. This certification is traceable to the international system of unit maintained at :-

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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Page 2 of 6

F-CAL-005 Ed.1



Certificate No.: CP20240324EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.6
C-weighting	28.4
Z-weighting	34.3

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.2	-0.2	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.0	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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F-CAL-005 Ed.1



Certificate No.: CP20240324EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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F-CAL-005 Ed.1



CALIBRATION LABORATORY CO., LTD.

210-11, 14, 15 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd. Ladphras, Bangkok 10230
Tel: 02-578-0553-4 Fax: 02-578-2672 www.calibration.co.th E-mail: sale@calibration.co.th



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point (g) (frequency)	Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
0.3 50 Hz	peak	0.300	0.358	+0.003	1.9
0.4 50 Hz		0.400	0.397	+0.003	1.6
0.5 50 Hz		0.500	0.456	-0.004	1.6
0.6 50 Hz		0.600	0.594	-0.006	2.5
0.7 50 Hz		0.700	0.693	+0.007	2.5
0.3 100 Hz	peak	0.300	0.301	-0.001	1.9
0.4 100 Hz		0.400	0.399	+0.001	1.6
0.5 100 Hz		0.500	0.497	-0.003	1.6
0.6 100 Hz		0.600	0.596	+0.004	2.5
0.7 100 Hz		0.700	0.696	+0.004	2.5

2. VELOCITY RESULT

Test point (mm/s) (frequency)	Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
3 50 Hz	peak	3.000	3.013	-0.013	1.8
4 50 Hz		4.000	4.028	-0.028	1.8
5 50 Hz		5.000	5.036	-0.036	1.8
6 50 Hz		6.000	6.039	-0.039	1.8
7 50 Hz		7.000	7.048	-0.048	1.8
3 100 Hz	peak	3.000	3.014	-0.014	1.6
4 100 Hz		4.000	4.021	-0.021	1.6
5 100 Hz		5.000	5.029	-0.029	1.6
6 100 Hz		6.000	6.032	-0.032	1.5
7 100 Hz		7.000	7.038	-0.038	1.5

Certificate No. Q24059622

F3-011-05/12-23

Page 3 of 4

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CALIBRATION LABORATORY CO., LTD.

210-11, 14, 15 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd. Ladphras, Bangkok 10230
Tel: 02-578-0553-4 Fax: 02-578-2672 www.calibration.co.th E-mail: sale@calibration.co.th



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point (mm) (frequency)	Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
0.03 50 Hz	peak	0.030	0.030	0.000	2.5
0.04 50 Hz		0.040	0.040	0.000	2.1
0.05 50 Hz		0.050	0.050	0.000	1.9
0.06 50 Hz		0.060	0.059	+0.001	1.8
0.07 50 Hz		0.070	0.069	+0.001	1.8
0.03 100 Hz	peak	0.030	0.030	0.000	2.5
0.04 100 Hz		0.040	0.040	0.000	2.1
0.05 100 Hz		0.050	0.050	0.000	1.9
0.06 100 Hz		0.060	0.059	+0.001	1.8
0.07 100 Hz		0.070	0.069	+0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1 2 of 67

* means Calibrations marked * Not ANAB Accredited * in this Certificate have been included for completeness.

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24059622

F3-011-05/12-23

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert.No.: 24CH40
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA9M0046
ID No. : UAE.EFM.001/2563(EFM.pH.01/03)
Condition As-Received: Used Item
Received Date : 09 January 2024
Calibration Date : 10 January 2024
Reference : 2401-0219WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH5 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagrakul

Approved by :

(✓) Sathip Meangmai
() Warakorn Lemgagrakul
() Porpan Palpin

Issue Date : 16 January 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than to full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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Cert.No.: 24CH40
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I908	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.868	CPA chem	931959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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 (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage factor
pH Meter S/N.: HA9M0046	pH	mV	mV	pH	k
	4.00	177.48	177.5	4.01	
	7.00	0.00	0.2	7.00	
	10.00	-177.48	-177.0	10.01	

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Cert.No.: 24CH40
Page: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N: -	4.008	4.01	171.9	0.0079	2.00
	6.986	6.99	-2.2	0.0063	2.00
	6.986	6.99	-3.6	0.0093	2.00
	9.997	10.01	-171.0	0.011	2.07

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :

- Serial No. :

Dimension of probe;

- Length : 103 mm

- Diameter : 16 mm

- Immersion Depth : 90 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
35.0	35.003	35.0	-0.003	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 %.

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Signature

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Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING

Address : CONSULTANT CO.,LTD.

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok,

Prakanong, Bangkok 10260

Certificate No : 24-ACT-091

Request No : Req-2024-1380

Unit Under Calibration Details

Measurement item : Acoustic Calibrator

Manufacturer : SVANTEK

Model : SV 36

Serial Number : 107224

ID : UAE.EFM.171/2564

Class : 1

Range : 94 , 114 dB / 1000 Hz

Instrument Status : Used

Calibration Environment and Details

Temperature : (23 \pm 2 °C)

Humidity : (50 \pm 20 %RH)

Barometric Pressure : (1013 \pm 10.0 hPa)

Received Date : 24 June 2024

Calibration Date : 26 June 2024

Location of Calibration : LAB 1 Acoustic

Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	38079	EEI	12 June 2025
THD Multimeter	2015	104765	NJMT	16 January 2025

Traceability

This certificate provides traceability of measurement to recognized national standard, and to the realization of the International System of Units (SI).

Note

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

Calibrated By :

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 26 June 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the body.
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Rev.706-ACT-02 Rev.03 Issue date 5/6/24



Page 2 of 3

Certificate No : 24-ACT-091

Request No : Req-2024-1380

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (\pm dB)	Acceptance limit Class 1 (\pm dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	94.02	0.02	-	-	0.14	0.25	Pass
114 dB / 1000 Hz	114.05	0.05	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (\pm %)	Acceptance limit Class 1 (\pm %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (\pm %)	Acceptance limit Class 1 (\pm %)	Result
	Measured (%)	Measured (%)	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.24	-	-	-	0.40	2.5	Pass
114 dB / 1000 Hz	0.44	-	-	-	0.40	2.5	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

* Acceptance Limit was IEC 60942:2017 Class 1

† The calibration results exclude the microphone volume correction

- The calibration results exclude the microphone volume correction

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the body.
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Rev.706-ACT-02 Rev.03 Issue date 5/6/24



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Certificate No : 24-ACT-091

Request No : Req-2024-1380

Decision Rule for Statements of Conformity

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability, were within the limit.

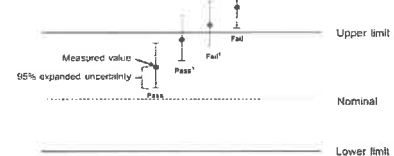
Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability, were outside the limit.

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability, were within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability, were outside the limit.

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability, were within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability, were outside the limit.



End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the body.
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Rev.706-ACT-02 Rev.03 Issue date 5/6/24



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24H753
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.127/2550
Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
to 18 April 2024
Reference: 2404-0247WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomeuk 41, Sukhumvit Road,
Bangkok, Phrakhenong, Bangkok 10260

Procedure used: Calibration was conducted using in-house calibration procedure CP-H02 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21596	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	ASA339	231238	16 Oct 2024

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

3. This Calibration is traceable to the International System of Unit maintained through:-

- Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0
- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by: Chetkrit Waewwanjua
Issue Date: 18 April 2024

Approved Signatory:

[] Chetkrit Waewwanjua
[✓] Viporn Tantayewutti
[] Urochphol Harechai

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Cert. No.: 24H753
Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration: Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC*: Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied
by coverage factor k = 2.00, providing confidence level approximately 95%.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
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TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 24P1251
Page: 1 of 2

Equipment: U Tube Manometer
Manufacturer: Dwyer
Model: 1221-36-W/M
Serial No.: -
ID No.: UAE.EFM.077/2566
Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 11 April 2024
Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1012 mbar

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Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomeuk 41, Sukhumvit Road, Bangkok,
Phrakhenong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P04, using "DKD-R 6-1; Calibration of Pressure Gauges" as
a guideline.

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1169	MP-0175-23	12 Sep 2024

2. This result of calibration was made on requested at the point specified by customer.

3. Scale and conversion factor is 1 kPa = 4.0146283 inH₂O

4. This instrument was used clean air as pressure media.

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

7. The certificate is valid only to the item calibrated on date and place of calibration.

8. This Calibration is traceable to the International System of Unit maintained through:-

- National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by: Sukran Khonkeaw
Issue Date: 17 April 2024

Approved Signatory:

[] Phatinee Prabpalee
[] Sura Suwanmest
[✓] Attapol Panurach

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Cert.No.: 24P1251
Page: 2 of 2

Result of calibration: Without adjustment
Function: Pressure Measurement
Increasing Pressure

Range: 0 inH₂O to 36 inH₂O
Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC Indication Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.05	-7.05	14.10	0.10
16.00	8.05	-8.05	16.10	0.10
18.00	9.05	-9.05	18.10	0.10
20.00	10.05	-10.05	20.10	0.10
22.00	11.05	-11.05	22.10	0.10
24.00	12.05	-12.05	24.10	0.10
26.00	13.05	-13.05	26.10	0.10
28.00	14.05	-14.05	28.10	0.10
30.00	15.05	-15.05	30.10	0.10
32.00	16.05	-16.10	32.15	0.15
34.00	17.05	-17.10	34.15	0.15
36.00	18.00	-18.00	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD 801 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX 0-2719-9484



NAC
NAC-100 TIS 17025
CALIBRATION 0367

Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment : Aneroid Barometer
Manufacturer : Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WSC
Ambient Temperature: $(23 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 15) \%$
Atmospheric Pressure: 1007 mbar

Submitted by: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udumruk 41, Sukhumvit Road, Bangkok,
Phraekhong, Bangkok 10260

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except with the prior written approval of the head of
Corporate Services & Equipment Calibration and Testing Services.

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P10, using "DKD-R 6-1: Calibration of Pressure Gauges" as
a guideline.

Condition of this result of calibration

1. Reference standards Instruments:

- | Instrument | Model | Serial No. | Certificate No. | Due Date |
|-----------------------|--------|------------|-----------------|-------------|
| 1) Standard Barometer | DPI142 | 1422505046 | MP-0094-23 | 03 May 2024 |
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.
3. This result of calibration was made on requested at the point specified by customer.
4. This result of calibration instrument was in absolute pressure.
5. This instrument was used clean air as pressure media.
6. The certificate is valid only to the item calibrated on date and place of calibration.
7. This Certification is traceable to the International System of Unit maintained through:
- National Institute of Metrology Thailand (NIMT)

Calibrated by: Suteen Khankasaw
Issue Date: 23 April 2024

Approved Signatory:

| J Phalinee Prabpalai
| J Sura Suwanee
| J Atapol Panurech

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Cert.No: 24P1367
Page: 2 of 2

Result of calibration: Without adjustment

Range: 980 hPa to 1030 hPa

Function: Absolute Pressure Measurement

Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.13	958.77	960.13	990.56	1001.26	1011.35	1022.10	1032.51
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.51	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

*UUC = Unit Under Calibration

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

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J NAC
JIRANATTE ASSOCIATES CO., LTD.

Jirante Associates Co., Ltd.
63/1-15, 67/3-36
Pattana 7/21, Rd. Wanhap, Bangkok 10160
Bangkok 10600 (Thailand)
Tel: +6628580212
Mobile: +66285809453
E-mail: jirante@jirante.com
Web site: www.jirante.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NAC-TIS-TIS 17025
CALIBRATION 0367

Flow measurement laboratory
Calibration services department



NAC - TIS - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No.: CUF-002-66

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER : Top Lead Office
MODEL/TYPE : Andersen Instruments
SERIAL NUMBER : 025A
ID NUMBER : 1301
CONDITION AS-RECEIVED : UAE.ANV.051/2547
CUSTOMER : Used Item

RECEIVED DATE : 07 Jul 2023
MEASUREMENT DATE : 14 Jul 2023
ISSUE DATE : 18 Jul 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions
Measurement Condition : The average values during measurement are 23.0 °C and 54.5% RH.

NOTE: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Office gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots
Meter) Model G55/MC/W2-dp. The Wt-CT-004
was used as a calibration guideline.

Traceability:

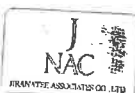
This certificate provides a traceability of the
measurement to recognize the national
standards, and to realization of the international
system of units (SI) through the VSL (National
Metrology Institute of Netherlands) via Certificate
number: 02211901

Uncertainty of Measurement:

The reported uncertainty of measurement is based
on the standard uncertainty multiplied by a
coverage factor $k=2$, which for a normal
distribution corresponds to a coverage probability
of approximately 95%. The standard uncertainty
has been determined in accordance with the GUM
("Evaluation of measurement
data - Guide to the expression of uncertainty in
measurement")

Calibrated by:

Mr. Sarawit Thuchaid
Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Porinye Booncharoen
Calibration Department Manager

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THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED
IN WRITINGS FROM THE LABORATORY



Continuation of Certificate of Calibration Number CUF-002-66

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The Office gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The humid air was used as a
medium in the system. The standard conditions are 25 °C (288.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure (Pa) mmHg	Temperature (Ta) °C	Temperature (Tm) °C	Ap_meter mmHg	Ap_Office mmHg	γ	Standard Flow (Q_s) m^3/min
1	0.701	754.115	23.87	23.10	55.600	1.676	1.273	0.648
2	0.997	754.083	23.80	23.23	61.350	3.236	1.705	0.914
3	1.121	754.005	23.81	23.20	41.923	4.338	2.079	1.057
4	1.172	754.004	23.72	23.16	30.933	4.891	2.208	1.122
5	1.410	753.994	23.76	23.18	29.435	7.159	2.673	1.352

Slope (m): 1.88463

Intercept (b): -0.01686

Correlation coefficient (r): 0.99972

Uncertainty ($k=2$): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure (Pa) mmHg	Temperature (Ta) °C	Temperature (Tm) °C	Ap_meter mmHg	Ap_Office mmHg	γ	Standard Flow (Q_s) m^3/min
1	0.701	754.115	23.87	23.10	55.600	1.676	0.800	0.651
2	0.997	754.083	23.80	23.23	61.350	3.236	1.120	0.917
3	1.121	754.005	23.81	23.20	41.923	4.338	1.307	1.061
4	1.172	754.004	23.72	23.16	30.933	4.891	1.388	1.126
5	1.410	753.994	23.76	23.18	29.435	7.159	1.679	1.357

Slope (m): 1.24306

Intercept (b): -0.01029

Correlation coefficient (r): 0.99972

Uncertainty ($k=2$): 0.015 m^3/min

End of Certificate of Calibration



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Certificate No.: CP20240324EA
Operation No.: CP2024080295

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.EFM.035/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260
Received Date: 9 August 2024
Calibrated Date: 22 - 27 August 2024
Issued Date: 28 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k)
providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except
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Page 1 of 6

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F-CAL-004 Ed.1



Certificate No.: CP20240324EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.EFM.035/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023	24 March 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CD20240142EA	12 June 2025
7) Performance Audio Analyzer	U8903B	MYS6510003	CL1-P240030	11 April 2025
			CD20240143EA	12 June 2025
			CB20240035EB	13 February 2025
			CK20230072EA	13 September 2024

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

3. This certification is traceable to the international system of unit maintained at :-

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance Limits (dB)
-	-	-	-

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Page 2 of 6

F-CAL-005 Ed.1



Certificate No.: CP20240324EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
28.6

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.6
C-weighting	28.4
Z-weighting	34.3

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance Limits (dB)
125	0.1	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.2	-0.2	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance Limits (dB)
63	-0.1	0.0	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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Page 3 of 6

F-CAL-005 Ed.1



Certificate No.: CP20240324EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance Limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance Limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance Limits (dB)
94.0	94.0	0.0	±0.6
99.0	99.0	0.0	±0.6
104.0	104.0	0.0	±0.6
109.0	109.0	0.0	±0.6
114.0	114.0	0.0	±0.6
119.0	119.0	0.0	±0.6
124.0	124.0	0.0	±0.6
129.0	129.0	0.0	±0.6
134.0	134.0	0.0	±0.6
139.0	139.0	0.0	±0.6

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F-CAL-005 Ed.1



Certificate No.: CP20240324EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	0.2	+1.0; -1.5
	0.25	109.7	-0.3	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	0.0	+1.0; -3.0
	200	130.0	0.0	±0.5
LAE	2	110.0	0.0	+1.0; -1.5
	0.25	100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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Function : 10. Overload Indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.6	143.4	-0.2	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

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CALIBRATION LABORATORY Co., LTD.

81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 731A2601/721A3301
SERIAL NO. : UM11355/UM11355 [UAE.EFM.002/2560]
CLID. NO. : 252000637
JOB CONTROL NO. : 240608059622
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 08 June 2024

DATE OF ISSUED : 12 June 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
12 June 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24059622

F3-011-05/12-23



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CALIBRATION LABORATORY Co., LTD.

81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 731A2601/721A3301
SERIAL NO. : UM11355/UM11355 [UAE.EFM.002/2560]
DATE OF CALIBRATION : 11 June 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 3)^\circ\text{C}$ Relative Humidity : $(55 \pm 15)\%\text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 10063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29520.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-03-16-23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0650-24, Due Date 12 May 2025.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

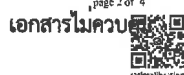
UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-402 M:2022)"

Certificate No. Q24059622

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CALIBRATION LABORATORY CO., LTD.

210-11, 14, 25 Soi Praset Mankit 29 Yaek 4, Praset Mankit Rd. Ladphao, Bangkok, 10230
Tel: 02-678-0353-4 Fax: 02-678-2672 www.ccl-laboratory.com E-mail: sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.298	+0.002	1.9
0.4	50 Hz		0.400	0.397	+0.003	1.6
0.5	50 Hz		0.500	0.496	+0.004	1.6
0.6	50 Hz		0.600	0.594	+0.006	2.5
0.7	50 Hz		0.700	0.693	+0.007	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.399	+0.001	1.6
0.5	100 Hz		0.500	0.497	+0.003	1.6
0.6	100 Hz		0.600	0.596	+0.004	2.5
0.7	100 Hz		0.700	0.696	+0.004	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.013	-0.013	1.8
4	50 Hz		4.000	4.028	-0.028	1.8
5	50 Hz		5.000	5.036	-0.036	1.8
6	50 Hz		6.000	6.039	-0.039	1.8
7	50 Hz		7.000	7.048	-0.048	1.8
*3	100 Hz	peak	3.000	3.014	-0.014	1.6
*4	100 Hz		4.000	4.021	-0.021	1.6
*5	100 Hz		5.000	5.029	-0.029	1.6
*6	100 Hz		6.000	6.032	-0.032	1.5
*7	100 Hz		7.000	7.038	-0.038	1.5

Certificate No. Q24059622

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.059	+0.001	1.8
0.07	50 Hz		0.070	0.069	+0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.059	+0.001	1.8
0.07	100 Hz		0.070	0.069	+0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1 2 of 67

* Items Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24059622

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