

# REPORT OF CALIBRATION

Certificate No. : SP23-008

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.72	241.0	0.72	0.18	2.00
279.45	278.8	0.65	0.18	2.00
287.81	287.9	-0.09	0.18	2.00
334.06	333.5	0.56	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	418.0	0.59	0.18	2.00
445.94	445.8	0.14	0.18	2.00
453.66	453.0	0.66	0.18	2.00
460.02	459.5	0.52	0.18	2.00
536.59	536.5	0.09	0.18	2.00
637.98	638.0	-0.02	0.18	2.00
431.38	430.6	0.78	0.18	2.00
472.50	472.0	0.50	0.18	2.00
513.47	513.0	0.47	0.18	2.00
528.88	528.5	0.38	0.18	2.00
573.17	573.7	-0.53	0.18	2.00
585.35	585.0	0.35	0.20	2.00
684.40	684.0	0.40	0.18	2.00
740.72	740.5	0.22	0.20	2.00
748.55	748.5	0.05	0.18	2.00
807.03	807.0	0.03	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 -

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FM-708-02 R01 1/11/2021



**PerkinElmer**  
For the Better

## PinAAcle 900F Preventive Maintenance Report

Company Name: UNITED ANALYST AND ENGINEERING

Instrument Location: BANGCHAK, PRAKHANONG  
BANGKOK, 10260

Instrument Serial No.: PFBS20031902


Date: 20-Jul-2022

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PinAAcle 900F Preventive Maintenance (PM)

Company Name: UNITED ANALYST AND ENGINEERING			
Address (Instrument Location): BANGCHAK, PRAKHANONG, BANGKOK, 10260			
Serial Number:	PFB520031902	PM Number:	2/2
Customer Name (if applicable):	K. SATHIDA	Telephone Number:	095-5580-049
Customer Support Engineer Name:	K. DUANG	Service Order Number:	WO-01710010
Date PM Performed: (DD-MMM-YYYY)	Jul 20, 2022	Next PM Due Date: (DD-MMM-YYYY)	Jan 20, 2023
Standard Labor Hours to Complete PM :			5 hours

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

**PerkinElmer®**

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

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	25-76CUY1	30-Oct-2022

Additional Reagents and Standards Required for PM (Customer Support Solution)

Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	D1 Water	250 ml.	AR	AR
N/A	0.5% HNO <sub>3</sub>	250 ml.	AR	AR

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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 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.

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-252
N1013002	1.0A Neutral density filter	1	MG0-358
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190



7. Flame Interlock Check:

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

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
C <sub>2</sub> H <sub>2</sub> Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> 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.	0.9798	0.9848	Passed
0.2 A ND Filter	± 5% from Cert.	0.2042	0.1963	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	0.0008	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

8.4 D<sub>2</sub> Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0049	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	0.0003	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	0.0005	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.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3353	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.



## 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:  
20-Jul-2022  
(DD-MMM-YYYY)

Authorized Customer Representative:

Date:  
20-Jul-2022  
(DD-MMM-YYYY)

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Request No. 25-66 / 0323

MTC. ACL.No. 387 / 66

## CALIBRATION CERTIFICATE

NOMENCLATURE : 1. Atomic Absorption Spectrophotometer "Agilent Technologies"

Model AA240FS, Serial No. MY13160001  
Working standard solution "Inorganic Ventures"

Multi Analyte Custom Grade Solution, Lot No. S2-MEB708640

SUBMITTED BY : United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

CALIBRATION PROCEDURE : 1. Performance Verification of Atomic Absorption Spectrophotometer (WI-500-02-30)

2. Estimation Uncertainty of Measurement in Analytical Chemistry (QP-513)

CALIBRATION RANGE: 0.02,0.10,0.30,0.50,0.70 mg/l at 228.8 nm.Cd, 0.10,0.20,0.30,0.50,0.70 mg/l at 357.9 nm.Cr, 0.05,0.10,0.30,0.50,0.70 mg/l at 324.7 nm.Cu, 0.10,0.30,0.50,0.70,1.00 mg/l at 248.3 nm.Fe, 0.20,0.50,0.70,1.00,1.50 mg/l at 217.0 nm.Pb, 0.05,0.10,0.30,0.50,0.70 mg/l at 279.5 nm.Mn, 0.10,0.30,0.50,0.70,1.00 mg/l at 232.0 nm.Ni, 0.05,0.10,0.30,0.50,0.70 mg/l at 213.9 nm.Zn

CALIBRATION DATE : 2 February 2023

REFERENCE MATERIAL : Traceable to NIST "Carlo Erba", "PanReac AppliChem"

Cadmium Lot No. 1152457, Chromium Lot No. 1793249, Copper Batch No. T117098A, Iron Batch No. T126087A,

Lead Lot No. 1227873, Manganese Batch No. T109228A, Nickel Batch No. T270178A, Zinc Batch No. T820140A

AMBIENT CONDITIONS : Temperature 22 °C Relative humidity 58 %

The Atomic Absorption Spectrophotometer has been calibrated against Reference Material traceable to National Institute of Standards and Technology ( NIST ) by The Analytical Chemistry Laboratory. The results are attached herewith.

Calibrated by 1. ....

2. ....  
( Mr. Atipat Ratana )

Approved by ....

(Miss Sutadda Deawong)

Senior Technical Officer

Acting Director of Analytical Chemistry Laboratory

Ref. 2015266012600366001

Issued Date : 15 February 2023

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CALIBRATION DATA

1. Noise Level

Element	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn
Absorbance	0.0020	0.0000	0.0008	0.0000	-0.0009	0.0021	-0.0016	-0.0022
	0.0015	0.0006	0.0005	-0.0009	-0.0014	0.0018	0.0002	-0.0023
	0.0014	0.0006	0.0010	-0.0009	0.0015	0.0008	-0.0004	-0.0015
	0.0021	-0.0008	0.0013	-0.0010	0.0005	0.0005	-0.0008	-0.0004
	0.0020	-0.0012	0.0004	0.0003	-0.0004	0.0001	-0.0024	-0.0001
	0.0021	-0.0011	0.0011	0.0003	0.0006	0.0009	-0.0002	-0.0013
	0.0017	-0.0009	0.0001	-0.0015	0.0010	0.0007	0.0001	-0.0016
	0.0024	-0.0012	0.0004	-0.0002	0.0008	-0.0005	-0.0012	-0.0019
	0.0011	-0.0002	0.0015	-0.0004	0.0004	0.0008	-0.0003	-0.0017
	0.0017	0.0000	0.0009	0.0004	0.0001	0.0015	-0.0009	-0.0024
	0.0019	-0.0004	0.0004	0.0000	0.0006	0.0010	-0.0005	-0.0016
	0.0016	-0.0025	0.0003	0.0005	0.0009	-0.0004	-0.0013	-0.0016
	0.0018	-0.0014	0.001	-0.0009	-0.0006	0.0010	-0.0004	-0.0017
	0.0019	-0.0006	0.0011	-0.0008	0.0011	0.0004	-0.0003	-0.0005
	0.0024	0.0003	0.0005	-0.0012	-0.0002	0.0012	-0.0006	-0.0011
	0.0023	-0.0012	0.0006	-0.0007	0.0002	0.0014	-0.0012	-0.0013
	0.0020	-0.0014	0.0009	-0.0018	0.0003	0.0012	-0.0012	-0.0013
	0.0010	-0.0015	0.0002	0.0004	0.0017	0.0011	-0.0018	-0.0013
	0.0016	-0.0011	0.0013	0.0003	0.0007	0.0026	-0.0006	-0.0006
	0.0001	-0.0007	0.0009	-0.0003	0.0008	0.0008	0.0000	-0.0001
Average Absorbance	0.002	-0.001	0.001	0.000	0.000	0.001	-0.001	-0.001

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2. Precision

Element	Conc. (mg/l)	Absorbance															Ave. Abs.	SD	%RSD
		0.0085	0.0084	0.0090	0.0089	0.0089	0.0089	0.0090	0.0086	0.0092	0.0090	0.0089	0.0099	0.0088	0.0092	0.0090			
Cd	0.02	0.0085	0.0084	0.0090	0.0089	0.0089	0.0089	0.0090	0.0086	0.0092	0.0090	0.0089	0.0099	0.0088	0.0092	0.0090	0.0099	0.0003	2.88
	0.30	0.0993	0.1001	0.1007	0.1004	0.1004	0.1004	0.0995	0.0997	0.0998	0.0999	0.0999	0.100	0.0996	0.0999	0.0999	0.100	0.0005	0.45
	0.70	0.2238	0.2229	0.2244	0.2249	0.2243	0.2243	0.2233	0.2235	0.2231	0.2231	0.2240	0.224	0.2240	0.2231	0.2240	0.224	0.0007	0.33
Cr	0.10	0.0088	0.0087	0.0094	0.0086	0.0086	0.0086	0.0091	0.0099	0.0095	0.0099	0.0085	0.009	0.0085	0.0095	0.0076	0.009	0.0006	7.25
	0.30	0.0257	0.0265	0.0255	0.0270	0.0266	0.0258	0.0258	0.0261	0.0262	0.0274	0.0262	0.026	0.0262	0.0262	0.0274	0.026	0.0006	2.25
	0.70	0.0573	0.0590	0.0580	0.0576	0.0578	0.0579	0.0593	0.0593	0.0599	0.0586	0.0594	0.058	0.0594	0.0599	0.0586	0.058	0.0009	1.51
Cu	0.05	0.0083	0.0084	0.0084	0.0075	0.0086	0.0086	0.0086	0.0081	0.0080	0.0087	0.0092	0.008	0.0092	0.0080	0.0087	0.008	0.0005	5.45
	0.30	0.0430	0.0444	0.0426	0.0429	0.0435	0.0432	0.0432	0.0428	0.0441	0.0427	0.0436	0.043	0.0436	0.0441	0.0427	0.043	0.0006	1.41
	0.70	0.0981	0.0992	0.0990	0.0997	0.0977	0.0986	0.0990	0.0982	0.0988	0.0988	0.0980	0.099	0.0988	0.0992	0.0988	0.099	0.0006	0.63
Fe	0.10	0.0109	0.0104	0.0087	0.0100	0.0087	0.0087	0.0094	0.0102	0.0092	0.0094	0.0100	0.010	0.0100	0.0092	0.0094	0.010	0.0007	7.53
	0.50	0.0456	0.0442	0.0450	0.0444	0.0450	0.0450	0.0455	0.0455	0.0441	0.0446	0.0444	0.045	0.0446	0.0441	0.0446	0.045	0.0006	1.27
	1.00	0.0904	0.0901	0.0891	0.0876	0.0873	0.0873	0.0901	0.0876	0.0886	0.0879	0.0901	0.089	0.0901	0.0886	0.0879	0.089	0.0012	1.38
Pb	0.20	0.0093	0.0099	0.0104	0.0102	0.0104	0.0102	0.0109	0.0102	0.0103	0.0115	0.0117	0.010	0.0117	0.0103	0.0115	0.010	0.0007	6.85
	0.70	0.0344	0.0336	0.0336	0.0328	0.0338	0.0346	0.0346	0.0336	0.0331	0.0343	0.0350	0.034	0.0343	0.0331	0.0343	0.034	0.0007	2.02
	1.50	0.0709	0.0718	0.0706	0.0713	0.0698	0.0718	0.0712	0.0713	0.0713	0.0715	0.0719	0.071	0.0713	0.0713	0.0715	0.071	0.0006	0.90
Mn	0.05	0.0115	0.0130	0.0131	0.0127	0.0135	0.0136	0.0124	0.0136	0.0133	0.0124	0.0130	0.013	0.0133	0.0124	0.0130	0.013	0.0006	4.88
	0.30	0.0709	0.0700	0.0714	0.0704	0.0700	0.0705	0.0714	0.0698	0.0694	0.0700	0.0700	0.070	0.0698	0.0694	0.0700	0.070	0.0007	0.96
	0.70	0.1619	0.1633	0.1646	0.1638	0.1646	0.1646	0.1614	0.1632	0.1614	0.1636	0.1652	0.163	0.1636	0.1614	0.1636	0.163	0.0014	0.83
Ni	0.10	0.0113	0.0105	0.0113	0.0114	0.0110	0.0113	0.0117	0.0112	0.0112	0.0107	0.0117	0.011	0.0117	0.0112	0.0107	0.011	0.0004	3.45
	0.50	0.0509	0.0517	0.0508	0.0502	0.0517	0.0516	0.0516	0.0516	0.0523	0.0518	0.0503	0.051	0.0503	0.0518	0.0518	0.051	0.0007	1.36
	1.00	0.0997	0.1006	0.1006	0.1006	0.0996	0.0996	0.0998	0.1007	0.1000	0.1013	0.0999	0.100	0.1013	0.0999	0.1013	0.100	0.0006	0.55
Zn	0.05	0.0315	0.0309	0.0322	0.0304	0.0329	0.0312	0.0313	0.0313	0.0319	0.0308	0.0311	0.031	0.0311	0.0319	0.0308	0.031	0.0007	2.35
	0.30	0.1705	0.1728	0.1688	0.1693	0.1711	0.1704	0.1704	0.1704	0.1707	0.1708	0.1688	0.170	0.1688	0.1707	0.1708	0.170	0.0012	0.70
	0.70	0.3559	0.3572	0.3548	0.3560	0.3559	0.3550	0.3550	0.3579	0.3552	0.3574	0.3573	0.356	0.3573	0.3552	0.3574	0.356	0.0011	0.31

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

**Office/Laboratory**  
Sri 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak Bangkok 10900,  
Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : sunalee@tistr.or.th

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Request No. 25-66 / 0323

3 / 5

MTC. ACL. No. 387 / 66

3. Trueness

3.1 Reading on wavelength- Cadmium(Cd) at 228.8 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cd	0.02002	0.021	0.001	4.90	± 0.005
	0.30030	0.298	-0.002	0.77	± 0.005
	0.70070	0.675	-0.026	3.67	± 0.008

3.2 Reading on wavelength- Chromium (Cr) at 357.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cr	0.1001	0.101	0.001	0.90	± 0.009
	0.3003	0.293	-0.007	2.43	± 0.012
	0.7007	0.648	-0.053	7.52	± 0.023

3.3 Reading on wavelength- Copper (Cu) at 324.7 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cu	0.050	0.046	-0.004	8.00	± 0.003
	0.300	0.289	-0.011	3.67	± 0.009
	0.700	0.674	-0.026	3.71	± 0.020

Continue 4 / 5

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

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FMBL.MTC.002 Rev.4

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

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Thailand  
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Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th



Request No. 25-66 / 0323

4 / 5

MTC. ACL. No. 387 / 66

3.4 Reading on wavelength- Iron (Fe) at 248.3 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Fe	0.100	0.095	-0.005	5.00	± 0.014
	0.500	0.474	-0.026	5.20	± 0.016
	1.000	0.950	-0.050	5.00	± 0.029

3.5 Reading on wavelength- Lead (Pb) at 217.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Pb	0.200	0.207	0.007	3.50	± 0.014
	0.700	0.673	-0.027	3.86	± 0.030
	1.500	1.417	-0.083	5.53	± 0.061

3.6 Reading on wavelength- Manganese (Mn) at 279.5 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Mn	0.04995	0.046	-0.004	7.91	± 0.005
	0.29970	0.294	-0.0057	1.90	± 0.007
	0.69930	0.694	-0.0053	0.76	± 0.014

Continue 5 / 5

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

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Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

**Office**  
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Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th





Request No. 25-66 / 0323

5 / 5

MTC. ACL. No. 387 / 66

### 3.7 Reading on wavelength- Nickel (Ni) at 232.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Ni	0.1001	0.103	0.003	2.90	± 0.013
	0.5005	0.501	0.001	0.10	± 0.018
	1.0010	0.987	-0.014	1.40	± 0.032

### 3.8 Reading on wavelength- Zinc (Zn) at 213.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Zn	0.050	0.046	-0.004	8.00	± 0.013
	0.300	0.311	0.011	3.67	± 0.013
	0.700	0.665	-0.035	5.00	± 0.019

Remark : The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 ( $k = 2$ ) which gives a level of confidence of approximately 95%

Calibrated by 1.

Approved by.....

(Miss Sutadida Deawong)

Senior Technical Officer

Acting Director of

(Mr. Atipat Ratana)

Analytical Chemistry Laboratory

Issued Date : 15 February 2023

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

End of Certificate

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

**Office/Laboratory**  
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Tel. (66) 0 2323 1672-80 ext. 115, 116  
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Thailand  
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Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

FM.BL.MTC.002 Rev.4

**เอกสารไม่ควบคุม**  
เอกสารไม่ควบคุม

Calibration Certificate ID  
TH2058-043-050622-ACC-TH

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

METTLER TOLEDO



NSO-TIS JIS 17025  
CALIBRATION 0062

## Accuracy Calibration Certificate

### Customer

Company: United Analyst and Engineering Consultant Co., Ltd.  
Address: 3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak  
City: Phra Khanong  
Zip / Postal: 10260  
State / Province: Bangkok  
Order Number: 4037012766  
Contact: Suwit Chotnok

### Weighing Device

Manufacturer: Mettler Toledo  
Model: XSR205DU  
Serial No.: C210685394  
Building: N/A  
Floor: 2  
Room: Balance Room  
Instrument Type: Weighing Instrument  
Asset Number: UAE.WAO.010/2565  
Terminal Model: SRAT  
Terminal Serial No.: C210685394  
Terminal Asset No.: N/A

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)

METTLER TOLEDO Work Instruction: CP/W002/20

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

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

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

Range	Max. Capacity	Readability (d)
1	81 g	0.00001 g
2	220 g	0.0001 g

As Found Calibration Date: 06-May-2022

As Left Calibration Date: N/A

Issue Date: 09-May-2022

Approved Signatory:

Technical Manager / Head of Calibration Center

Software Version: 4.23.0.299  
Report Version: 2.16.15  
Form Number: F103C

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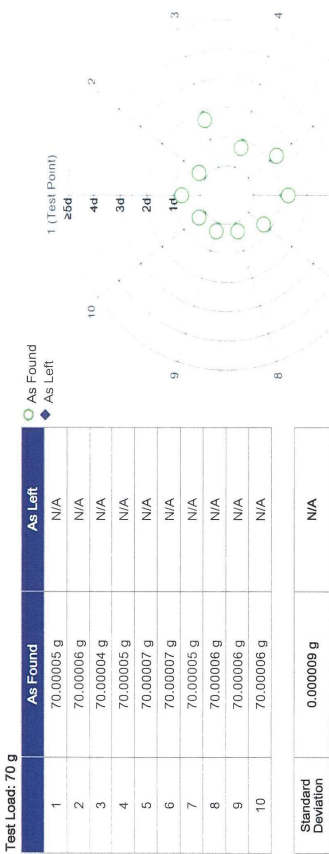
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Page 1 of 5

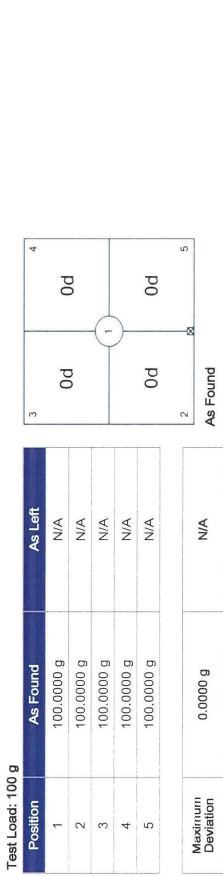
**เอกสารไม่ควบคุม**

## Measurement Results

### Repeatability



### Eccentricity

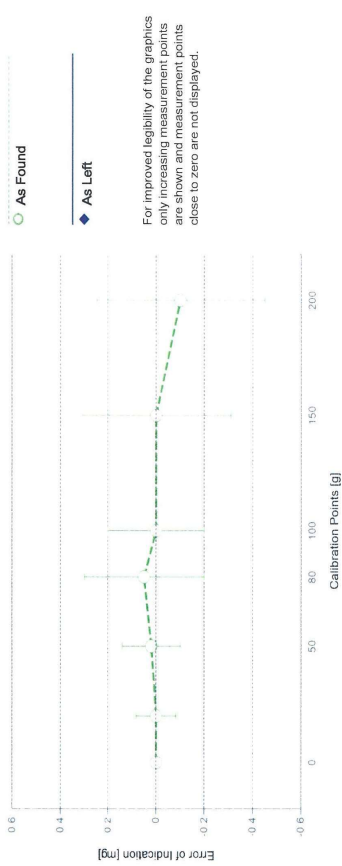


### Error of Indication

#### As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.020 mg	2
2	0.05000 g	0.05001 g	0.00001 g	0.023 mg	2
3	0.10001 g	0.10001 g	0.00000 g	0.025 mg	2
4	1.00000 g	1.00001 g	0.00001 g	0.034 mg	2
5	5.00001 g	5.00001 g	0.00000 g	0.049 mg	2
6	20.00002 g	20.00002 g	0.00000 g	0.082 mg	2
7*	50.00000 g	50.00002 g	0.00002 g	0.12 mg	2
8	80.00004 g	80.00009 g	0.00005 g	0.25 mg	2
9	100.00000 g	100.00000 g	0.00000 g	0.20 mg	2
10*	150.00000 g	150.00000 g	0.00000 g	0.31 mg	2
11	200.00000 g	199.99999 g	-0.00001 g	0.35 mg	2

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



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

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

### Test Equipment

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

#### Weight Set 1: OIML E2

Weight Set No.:	WS54	Date of Issue:	17-Nov-2020
Certificate Number:	170240	Calibration Due Date:	15-May-2022

#### Thermo Hygrometer

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

Remarks

- FACT adjustment functionality activated
- Equipment condition: Good
- Calibration after installation
- Next calibration according to customer's procedure
- Calibration data not decide by calibration laboratory

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

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

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

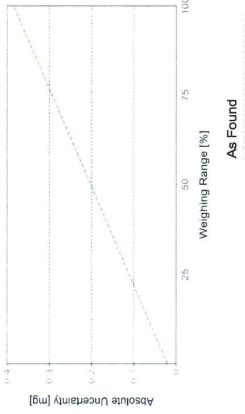
Linearization of Uncertainty Equation

	Range		As Found		As Left	
	d	Max				
1	0.00001 g	81 g	$U_1 = 0.021 \text{ mg} + 0.00450 \text{ mg/g} \cdot R$		N/A	
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.00448 \text{ mg/g} \cdot R$		N/A	

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

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

Net Indication		As Found		As Left	
0.00220 g		0.021 mg	0.95%	N/A	
0.02200 g		0.021 mg	0.096%	N/A	
0.22000 g		0.022 mg	0.0100%	N/A	
2.20000 g		0.031 mg	0.0014%	N/A	
220.0000 g		1.0 mg	0.00048%	N/A	



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.





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



NSC-TIS-TIS17025  
CALIBRATION 0008

Cert.No.: 23MM113  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Electronic Balance  
**Manufacturer :** Mettler Toledo  
**Model :** XSR205  
**Serial No. :** C210685394  
**ID No. :** UAE.WAO.010/2565

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

**Location :** Balance Room

**Received order :** 26 April 2023  
**Calibration Date :** 26 April 2023  
**Ambient Temperature :** 15 °C to 40 °C  
**Relative Humidity :** 30 % to 90 %

**Calibrated by :** Man Pattanapongpaiboon

**Approved by :**  Approved Signatory

( ) Ponthippa Tameyakul  
( ) Malee Bulkruea  
(✓) Suwit Imjai

**Issue Date :** 2 May 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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**Equipment :** Electronic Balance  
**Condition As-Received :** Used Item  
**Reference :** 2304-04590C-2

**Procedure used :-**

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

**Condition of this result of calibration**

1. Reference standard instruments:-

- 1) Standard Weight Set (E2) Model 15884 Serial No. 24053 ID No. 70RC007 Test report No. MM-0010-22 Due date 20 Jan 2024
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on requested at the point specified by customer.
4. This certificate is not certified for any commercial transaction.
5. This certification is traceable to the International System of Unit.

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

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

**Before Adjustment :**

Applied Weight ( g )	Balance Reading ( g )	Correction ( g )	Measurement Uncertainty ( ± mg )	Coverage Factor ( k )
80	79.99992	+0.00008	0.15	2.00
200	199.99995	+0.00005	0.29	2.00

**After Adjustment :**

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

Applied Weight ( g )	Standard Deviation of Reading ( g )
80	0.000007
200	0.000004

เอกสาร



Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2304-0459OC-2

#### 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	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0001	-0.0001	0.0000	-0.0001	-0.0001

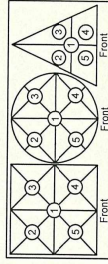
#### 3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.00000	0.00000	0.014	2.11
0.05	0.04999	+0.00001	0.015	2.09
0.1	0.09999	+0.00001	0.015	2.07
1	1.00000	0.00000	0.018	2.04
5	5.00000	0.00000	0.026	2.00
20	20.00002	-0.00002	0.045	2.00
50	50.00002	-0.00002	0.080	2.00
80	80.00002	-0.00002	0.15	2.00
100	100.00000	0.00000	0.17	2.00
150	150.00000	0.00000	0.29	2.00
200	199.99999	+0.00001	0.29	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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Cert.No.: 23MM113  
Page: 3 of 3



Maximum difference between  
off-center and central loading  
(g)  
0.0001

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NSC-TS1-7157025  
CALIBRATION 0008

Cert. No.: 22TM1490  
Page : 1 of 3

## Certificate of Calibration

Equipment : Hot Air Oven  
Manufacturer : Memmert  
Model : UF 55  
Serial No. : B216.1666  
ID No. : UAE.WAO.02712559  
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 : 19 October 2022  
Calibration Date : 19 October 2022  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Preecha Hiahb  
Approved by :   
( ) Pornthippa Tameyakul  
( ) Malee Butkruea  
(✓) Suwit Imjai

Issue Date : 31 October 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

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A 0046800





**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2210-0575OC-1  
**Procedure Used :-**

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

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

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

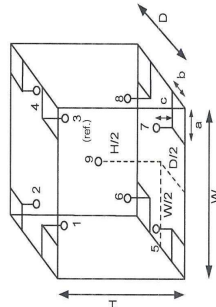
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close



**Probe Installation Details :**

**Dimension of Chamber :**  
a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm  
D = 0.33 m  
W = 0.40 m  
H = 0.40 m  
Capacity = 0.053 m<sup>3</sup>

Ref. Std. ID No. : @	
Calibration Point	
Position :	( 104 ) °C ( 140,180 ) °C
1	18-04RTD-01 21-04TC-01
2	18-04RTD-02 21-04TC-02
3	18-04RTD-03 21-04TC-03
4	18-04RTD-04 21-04TC-04
5	18-04RTD-05 21-04TC-05
6	18-04RTD-06 21-04TC-06
7	18-04RTD-07 21-04TC-07
8	18-04RTD-08 21-04TC-08
9 (ref.)	18-04RTD-09 21-04TC-09

Environment during calibration	
Temp. ( °C )	Beginning Finished
REL.Humid. ( % )	29 30
AC Supply ( Volt )	47 40
	221 220



**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2210-0575OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor k
104.0	104.0	104.0	0.061	1.3	1.7	0.42	2
140.0	140.0	140.0	0.14	2.3	2.4	1.1	2
180.0	180.0	180.0	0.21	3.5	3.6	1.3	2

Measured Temperature ( °C )								
Position								
1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.076	103.777	104.124	104.667	104.426	104.012	103.928	104.370
140.0	138.199	139.189	139.550	140.266	139.622	139.293	139.385	140.369
180.0	177.930	179.267	178.643	179.753	181.011	180.093	179.743	181.278

**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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เอกสารไม่คว

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



MSC18618167028  
CALIBRATION 0085

Cert. No.: 22TM1232  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** BOD Incubator

**Manufacturer :** Arco

**Model :** UC4-1320

**Serial No. :** -

**ID No. :** UAE.WAO.002/2550

**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 :** 15 August 2022  
**Calibration Date :** 15 August 2022  
**Ambient Temperature :** (26 ± 10 ) °C  
**Relative Humidity :** (50 ± 30 ) %

**Calibrated by :** Kunchit Promprat

**Approved by :**  Approved Signatory

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

**Issue Date :** 16 August 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0044201



**Equipment :** BOD Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2208-0186OC-1

**Procedure Used :-**

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

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

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

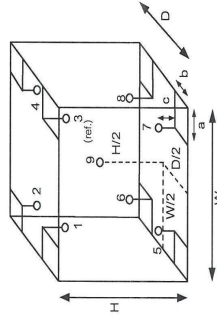
3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Not Available

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	28
REL.Humid. ( % )	61	63
AC Supply ( Volt )	227	227



**Probe Installation Details :**

a = 10 cm  
b = 10 cm  
c = 10 cm  
D = 0.53 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.76 m³

**Dimension of Chamber :**

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	18-10RTD-06
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

เอกสารไม่ควบคุม

a 1121247



**Equipment :** BOD Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2208-0186OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Not Available

**Cert. No.:** 22TM1232  
**Page:** 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	19.6	19.5	0.38	0.39	1.1	0.70	2
Measured Temperature (°C)							
Position							
1	2	3	4	5	6	7	8
20.050	20.264	19.851	19.771	19.928	20.169	19.886	19.829
9	10	11	12	13	14	15	16
20.001	20.001	20.001	20.001	20.001	20.001	20.001	20.001

**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 at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

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

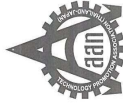
**UUC\* :** Unit Under Calibration

**Note :** The reported uncertainty of measurement was included stability and excluded uniformity .  
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

-o0o-

เอกสารไม่ควบคุม

a 1121246



**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. 0-2719-9484



ISO 17025  
CALIBRATION 0088

**Cert. No.:** 23TM249  
**Page :** 1 of 3

## Certificate of Calibration

**Equipment :** BOD Incubator

**Manufacturer :** Arco

**Model :** UC4-1320

**Serial No. :** 13URC4S013201

**ID No. :** UAE.WAO.015/2561

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

**Location :** Lab Floor 2

**Received Order :** 15 February 2023

**Calibration Date :** 15 February 2023

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Preecha Hlahib

**Approved by :**

Approved Signatory

( ) Pornthippa Tameyakul

( ) Malee Butkruea

( ) Suwit Imjai

**Issue Date :**

24 February 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.

เอกสารไม่ควบคุม

A 0051476





## CERTIFICATE OF CALIBRATION

**Equipment :** COD Test Tube Heater  
**Meter Model :** HI839800-02  
**Serial No. :** H018500I  
**Tube Heater :** 25 Vial Capacity  
**Accuracy :**  $\pm 2^{\circ}\text{C}$   
**Temperature Range :**  $-10^{\circ}\text{C}$  to  $160^{\circ}\text{C}$   
**Temperature of Reaction :**  $150^{\circ}\text{C}$   
**Ambient Temperature :**  $(25 \pm 2)^{\circ}\text{C}$   
**Relative Humidity :**  $(50 \pm 15)\% \text{ RH}$   
**Manufacturer :** Hanna Instruments  
**Made in :** Romania  
**Condition As-Received :** Used Product  
**Reference :** RE230392

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

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

**Received date :** 8 March 2023

**Calibrate date :** 10 March 2023

**Issue date :** 20 March 2023

**Calibrated Location :** Hanna Instruments (Thailand) Ltd.

**Calibration Procedure :** This calibrator was conducted by using in-house: calibration procedure

GP-04 by using certified reference material.

☒ Mr. Pichit Pethong

**Calibrated by :**

☐ Mr. Jakkapob Pentisan

**Approved by :**

Mr. Anan Suwanaisakul

☐ Mr. Channarong Soinak

Authorized Signatory



This certificate was certified only for the instrument we calibrated.

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

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

**เอกสารไม่ควบคุม**

## Condition of this calibration result

### Reference Standard Instruments:

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	MY44065265	WK2207-065-1	WK Electric Co., Ltd.

### Calibration Result:

#### Measurement Temperature Source Accuracy for COD Reactor

Capacity (Vial)	Nominal Value ( $^{\circ}\text{C}$ )	Average Value ( $^{\circ}\text{C}$ )	Uncertainty ( $^{\circ}\text{C}$ )	Tolerance of UUC ( $^{\circ}\text{C}$ )	Acceptance Criteria
25 Vial	150.0	150.3	0.59	2	Pass

Figure: Shows the location of the temperature source.

(1A)	(2A)	(3A)	(4A)	(5A)
149.78 $^{\circ}\text{C}$	150.31 $^{\circ}\text{C}$	150.63 $^{\circ}\text{C}$	149.93 $^{\circ}\text{C}$	150.31 $^{\circ}\text{C}$
(1B)	(2B)	(3B)	(4B)	(5B)
150.35 $^{\circ}\text{C}$	150.18 $^{\circ}\text{C}$	149.93 $^{\circ}\text{C}$	150.18 $^{\circ}\text{C}$	150.21 $^{\circ}\text{C}$
(1C)	(2C)	(3C)	(4C)	(5C)
150.24 $^{\circ}\text{C}$	151.10 $^{\circ}\text{C}$	150.80 $^{\circ}\text{C}$	150.36 $^{\circ}\text{C}$	150.86 $^{\circ}\text{C}$
(1D)	(2D)	(3D)	(4D)	(5D)
150.16 $^{\circ}\text{C}$	149.77 $^{\circ}\text{C}$	150.22 $^{\circ}\text{C}$	150.67 $^{\circ}\text{C}$	150.43 $^{\circ}\text{C}$
(1E)	(2E)	(3E)	(4E)	(5E)
149.94 $^{\circ}\text{C}$	150.44 $^{\circ}\text{C}$	150.06 $^{\circ}\text{C}$	150.63 $^{\circ}\text{C}$	149.29 $^{\circ}\text{C}$

Remark: The Acceptance criteria is the error value plus or minus the Measurement Uncertainty, and then Not More than the Tolerance value of UUC, therefore concluded that pass.

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

\*\*\* End of certificate \*\*\*

**เอกสารไม่ควบคุม**

## CERTIFICATE OF CALIBRATION

**Equipment :** COD Test Tube Heater  
**Meter Model :** HI839800-02  
**Tube Heater :** 25 Vial Capacity  
**Temperature Range :** -10 °C to 160 °C  
**Ambient Temperature :** (25 ± 2) °C  
**Manufacturer :** Hanna Instruments  
**Condition As-Received :** Used Product

**Serial No. :** H018500I  
**Accuracy :** ± 2 °C  
**Temperature of Reaction :** 150 °C  
**Relative Humidity :** ( 50 ± 15 )% RH  
**Made in :** Romania  
**Reference :** RE230392

**Customer name :** United Analyst and Engineering Consultant Co., Ltd.  
 3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak,  
 Phrakhanong, Bangkok 10260  
**Received date :** 8 March 2023  
**Calibrate date :** 10 March 2023  
**Issue date :** 20 March 2023  
**Calibrated Location :** Hanna Instruments (Thailand) Ltd.  
**Calibration Procedure :** This calibrator was conducted by using in-house: calibration procedure  
 GP-04 by using certified reference material.

**Calibrated by :** ☒ Mr. Pichit Pethong  
☐ Mr. Jakkapob Pentisan  
☐ Mr. Channarong Soinak  
**Approved by :** Mr. Anan Suwanaisakul  
 Authorized Signatory

This certificate was certified only for the instrument we calibrated.

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

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

**เอกสารไม่ควบคุม**

## Condition of this calibration result

### Reference Standard Instruments:

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	MY44065265	WK2207-065-1	WK Electric Co., Ltd.

### Calibration Result:

#### Measurement Temperature Source Accuracy for COD Reactor

Capacity (Vial)	Nominal Value (°C)	Average Value (°C)	Uncertainty (°C)	Tolerance of UUC (°C)	Acceptance Criteria
25 Vial	150.0	150.3	0.59	2	Pass

Figure: Shows the location of the temperature source.

(1A)	(2A)	(3A)	(4A)	(5A)
149.78°C	150.31°C	150.63°C	149.93°C	150.31°C
(1B)	(2B)	(3B)	(4B)	(5B)
150.35°C	150.18°C	149.93°C	150.18°C	150.21°C
(1C)	(2C)	(3C)	(4C)	(5C)
150.24°C	151.10°C	150.80°C	150.36°C	150.86°C
(1D)	(2D)	(3D)	(4D)	(5D)
150.16°C	149.77°C	150.22°C	150.67°C	150.43°C
(1E)	(2E)	(3E)	(4E)	(5E)
149.94°C	150.44°C	150.06°C	150.63°C	149.29°C

Remark: The Acceptance criteria is the error value plus or minus the Measurement Uncertainty, and then Not More than the Tolerance value of UUC, therefore concluded that pass.

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

\*\*\* End of certificate \*\*\*

**เอกสารไม่ควบคุม**

## Verification Certificate

**Certificate No.:** 2203368-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 4

**Equipment:** Digestor Unit  
**Manufacturer:** VLP SCIENTIFICA  
**Model:** DKL20  
**Serial No.:** 213517  
**ID No.:** UAE.WAS.005/2555  
**Order No.:** 2203368  
**Operation No.:** 2203368-001  
**Date of Receipt:** 22 June 2022  
**Date of Calibration:** 23-24 June 2022

**Calibrated by** Mr.Nuttapol Niyomchat **Approved by**  ( Mr.Pherapnat Tuanjit )  
Specialist Manager, Division of Calibration Laboratory  
**Date of Issue:** 30 June 2022 Responsible for the Technical Management Team

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

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

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

## Verification Report

**Certificate No.:** 2203368-001-01  
**Equipment:** Digestor Unit  
Model: DKL20 Serial No.: 213517  
Resolution: 1 °C ID No.: UAE.WAS.005/2555  
Manufacturer: VLP SCIENTIFICA  
**Date of Calibration:** 23-24 June 2022

Page 2 of 4

**Location:** Laboratory Room, NATIONAL FOOD INSTITUTE  
**Environment Condition:** Ambient Temperature ( 25 ± 1 ) °C  
Relative Humidity ( 58 ± 8 ) %  
Line Voltage ( 224 ± 2 ) Volt

### Condition of this results of Calibration:

1. This instrument was calibrated by insert standard thermocouples type S/R into its chamber and Calibration according to NFI Method W-TE-026 based on BS 4309 : 1968 : LABORATORY ELECTRIC RESISTANCE FURNACE.

- 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 Type R	MY4045576/MY41194453	TC22/0044	5-May-2023	N.M. Technical Center Laboratory

3. This certificate is traceable to International System of Units (SI Units).

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

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

6. Condition of Calibrated item : Good

UUC\* Description

Time of Record 1 Hour 6 Minute At 380 °C

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

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



## Verification Report

**Certificate No.:** 2203368-001-01  
**Equipment:** Digestor Unit  
Model: DKL20 Serial No.: 213517  
Resolution: 1 °C ID No.: UAE.WAS.005/2555  
Manufacturer: VELP SCIENTIFICA

**Date of Calibration:** 23-24 June 2022 380 °C 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	378 - 380	0.23	381.88	2.4
2	380	378 - 380	0.64	382.15	2.4
3	380	378 - 380	0.21	382.38	2.4
4	380	378 - 380	0.40	380.44	2.4
5	380	378 - 380	0.34	378.52	2.4
6	380	378 - 380	0.25	379.64	2.4
7	380	378 - 380	0.31	382.46	2.4
8	380	378 - 380	0.29	381.13	2.4
9	380	378 - 380	0.36	382.25	2.4
10	380	378 - 380	0.17	382.23	2.4
11	380	378 - 380	0.24	382.47	2.4
12	380	378 - 380	0.39	381.63	2.4
13	380	378 - 380	0.63	382.02	2.5
14	380	378 - 380	0.46	382.39	2.5
15	380	378 - 380	0.38	381.69	2.5
16	380	378 - 380	0.38	377.97	2.4
17	380	378 - 380	0.50	379.87	2.4
18	380	378 - 380	0.33	380.73	2.4
19	380	378 - 380	0.56	378.47	2.4
20	380	378 - 380	0.41	378.77	2.4

**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 providing a level of confidence of approximately 95 %.

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



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## Verification Report

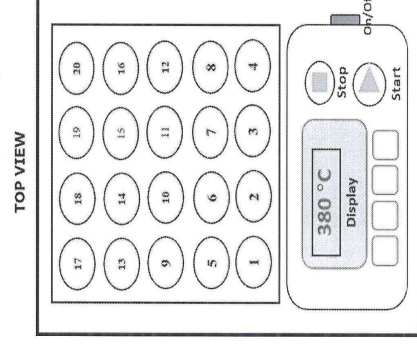
**Certificate No.:** 2203368-001-01  
**Equipment:** Digestor Unit  
Model: DKL20 Serial No.: 213517  
Resolution: 1 °C ID No.: UAE.WAS.005/2555  
Manufacturer: VELP SCIENTIFICA

**Date of Calibration:** 23-24 June 2022 380 °C Page 4 of 4

**Calibration point:**

**Calibration result:**

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



**Note:**

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

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

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



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



Cert. No.: 22TM672  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Memmert  
**Model :** IPP 260  
**Serial No. :** V616.0066  
**ID No. :** UAE.MIC.032/2559  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory (302)  
**Received Order :** 3 May 2022  
**Calibration Date :** 5 May 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Preecha Hlahib  
**Approved by :**   
( ) Ponthippa Tameyakul  
( ✓ ) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 11 May 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

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

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

### Condition of this result of calibration

1. Reference standard instrument:-

**Instrument** **Model** **Serial No.** **Cert. No.** **Due Date**  
1 ) Data Acquisition 34970A MY44067817 21LM10 20 Jul 2022  
2. This certificate is valid only to the item calibrated on date and place of calibration.

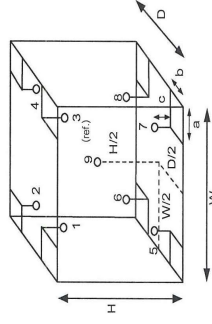
3. This certification is traceable to the International System of Unit.

### Result of Calibration :- ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Not Available

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



**Probe Installation Details :** **Dimension of Chamber :**  
a = 5.0 cm D = 0.50 m  
b = 5.0 cm W = 0.60 m  
c = 5.0 cm H = 0.80 m  
Capacity = 0.24 m<sup>3</sup>

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

เอกสารไม่ควบคุม



**Cert. No.:** 22TM672  
**Page.:** 3 of 3

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

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

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

**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  
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



**Cert. No.:** 23TM378  
**Page :** 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Memmert  
**Model :** IPP 260  
**Serial No. :** V615.0187  
**ID No. :** UAE.MIC.003/2559  
**Submitted by :** United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 11 April 2023  
**Calibration Date :** 12 April 2023  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Preecha Hlanhib

**Approved by :**   
( ) Ponthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Imjai  
**Issue Date :** 24 April 2023

Approved Signatory

**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.

เอกสารไม่ควา

เอกสารไม่ควา





**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2304-0155OC-1  
**Cert. No.:** 23TM378  
**Page :** 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-QT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY49001451	23LM27	25 Feb 2024

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

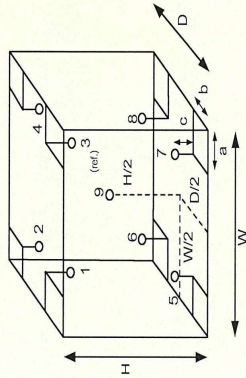
3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Not Available

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	25	26
REL.Humid. ( % )	57	61
AC Supply ( Volt )	220	220



**Probe Installation Details :**

a =	5.0	cm
b =	5.0	cm
c =	5.0	cm
D =	0.50	m
W =	0.64	m
H =	0.80	m
Capacity =	0.26	m <sup>3</sup>

เอกสารนี้



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2304-0155OC-1  
**Cert. No.:** 23TM378  
**Page :** 3 of 3  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Not Available

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor k
35.0	35.0	35.0	0.052	0.53	0.60	2

Measured Temperature ( °C )								
Position								
1	2	3	4	5	6	7	8	9 (ref.)
35.092	35.148	34.817	35.149	34.894	35.323	34.773	35.058	34.802
								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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เอกสารนี้



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



Cert. No.: 22TM1065  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Water Bath  
**Manufacturer :** Memmert  
**Model :** WB 14  
**Serial No. :** 1401.0569  
**ID No. :** UAE.MIC.004/2544  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 11 July 2022  
**Calibration Date :** 11 - 12 July 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Man Pattanapongpaiboon

**Approved by :**

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

**Issue Date :** 18 July 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

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**Equipment :** Water Bath  
**Condition As-Received :** Used Item  
**Reference :** 2207-0245OC-5  
**Procedure Used :-**  
Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).  
The temperature scale used was based on ITS-90.

Cert. No.: 22TM1065  
Page.: 2 of 3

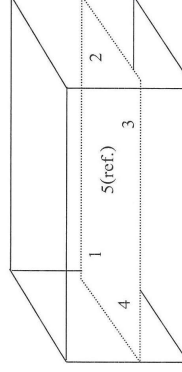
### Condition of this result of calibration

1. Reference standard instrument:-

**Instrument** **Model** **Serial No.** **Cert. No.** **Due Date**  
1 ) Data Acquisition 34972A MY57013823 22LM24 26 Feb 2023  
2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.

**Result of Calibration :-**  
( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

Beginning of Calibration Finished of Calibration	Environmental		AC Voltage Supply ( Volt )
	( °C )	( %R.H. )	
	25	59	223
	25	63	224



Front

Position :	Ref. Std. S/N.:
1	4804539-006
2	4804539-007
3	4804539-008
4	4804539-009
5(ref.)	4804539-010

เอกสารไม่ควบคุม





Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2207-0245OC-5  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 22TM1065  
Page.: 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			1	2	3	4	5 (ref.)
41.5	41.2	41.2	41.475	41.459	41.427	41.485	41.493

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
41.5	0.097	0.065	0.15	2

**Average\*** : The average of 30 values in each position.  
**Uniformity** : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
**Stability** : One-half of the greatest maximum difference of measured temperature at any one probe.  
**UUC\*** : Unit Under Calibration

**Note** : The reported uncertainty of measurement was included stability and excluded uniformity.  
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k$ , providing a level of confidence of approximately 95 %.

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เอกสารไม่ควรรักษา



## Certificate of Calibration

**Equipment:** Balance  
**Model:** PX623  
**Serial No. (or ID.):** C236754745  
**Manufacturer:** Ohaus  
**Condition:** New

**Certificate No.:** C01223732  
**Issued Date:** 09 December 2022  
**Job No.:** KSPR2215576  
**Page:** 1 of 2

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

**Environment Condition:** Temperature 26 °C ± 0.5 °C  
Humidity 53 %RH ± 3.9 %RH

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

**Calibration By:** Mr. Adisai Maknoi  
**Calibration Date:** 09 December 2022  
**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. C02221765

(Mr. Adisai Maknoi)  
Person in charge

(Mr. Rungrod Jenkitrakulchai)  
Authorized signatory

This certificate is issued 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.

บริษัท เทคโนโลยี จำกัด  
DKSH Technology Limited  
2533 Sukhumvit Road, Bangchak, Phra Khanong, Bangkok 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C01-14: 12 Sep 2022





Certificate No.: C01223732

Page: 2 of 2

### Calibration Results:

#### Without 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 200 (g)				
	A	B	C	D	E
	-	0.000	0.000	0.000	0.000

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

Nominal test value (g)	Standard Deviation
50	0.0004
500	0.0005

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	0.0010	2.03
5	5.0001	5.000	0.000	0.0010	2.03
10	10.0001	10.000	0.000	0.0010	2.03
20	20.0001	20.000	0.000	0.0010	2.03
50	50.0001	50.000	0.000	0.0010	2.03
100	100.0001	100.000	0.000	0.0011	2.03
200	200.0004	200.000	0.000	0.0011	2.02
300	300.0005	300.000	-0.001	0.0013	2.01
400	400.0008	400.001	0.000	0.0014	2.01
500	500.0003	500.000	0.000	0.0017	2.00
600	600.0004	600.000	0.000	0.0019	2.00

The End of Certificate

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DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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Refer to Certificate No.: C01223732

Page: 1 of 2

### 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 rule 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. Rungrod Jenkitrakulchai)

Authorized signatory

บริษัท ดีเคเอสเอช จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C01-14: 12 Sep 2022



Refer to Certificate No.: C01223732

Page: 2 of 2

### Statements of conformity:

Without Adjustment

Readability: 0.001 g

Nominal Value g	Error of indication g	Guard band (w) g	Tolerance (±) g	Conformity
1	0.000	0.0010	0.002	Pass
5	0.000	0.0010	0.010	Pass
10	0.000	0.0010	0.020	Pass
20	0.000	0.0010	0.040	Pass
50	0.000	0.0010	0.100	Pass
100	0.000	0.0011	0.200	Pass
200	0.000	0.0011	0.400	Pass
300	-0.001	0.0013	0.600	Pass
400	0.000	0.0014	0.800	Pass
500	0.000	0.0017	1.000	Pass
600	0.000	0.0019	1.200	Pass

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

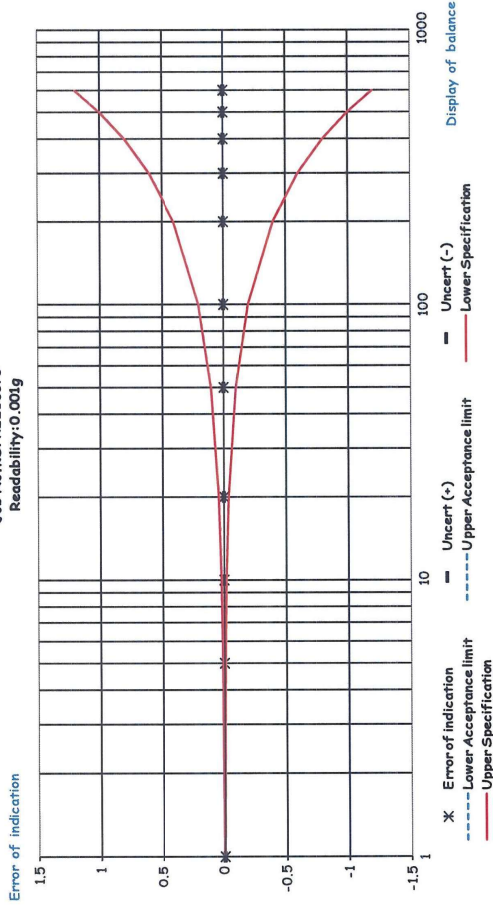
### The End of Statements of conformity

บริษัท ดีเคเอสเอช (ประเทศไทย) จำกัด  
DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
Phone: +66 2839 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C01-14: 12 Sep 2022

Without Adjustment  
Job No. KSPR2219576  
Readability: 0.001g



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



Cert. No.: 22TM89  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Autoclave  
**Manufacturer :** ALP  
**Model :** CL-40L  
**Serial No. :** 802664  
**ID No. :** UAE.MIC.014/2550  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Air Analysis Unit  
**Received Order :** 17 February 2022  
**Calibration Date :** 17 February 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Kunchit Promprat  
**Approved by :**  Approved Signatory  
( ) Ponthippa Tameyakul  
(✓) Malee Butkruea  
( ) Suwit Imjai  
**Issue Date :** 22 February 2022

The Uncertainties are for a confidence probability of approximately 95 %

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

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**Equipment :** Autoclave  
**Condition As-Received :** Used Item  
**Reference :** 2202-0444OC-1  
**Cert. No.:** 22TM89  
**Page.:** 2 of 3

### Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

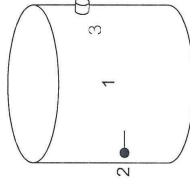
1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.  
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )  
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.  
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source



	Environmental	
	( °C )	( %R.H. ) ( Volt )
Beginning of Calibration	27	68
Finished of Calibration	27	65

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	22-10TC-01
2 =	Temperature sensor	22-10TC-02
3 =	Exhaust port	22-10TC-03

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Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2202-0444OC-1  
Result of Calibration :- ( \* ) Without Adjustment

Operating parameter Set : Temperature = 122 °C  
Sterilization period = 30 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
122	122	1	122.373	0.32	0.12	1.2	2
		2	122.421				
		3	122.292				

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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