

ภาคผนวกที่ 4

ใบรับรองการสอบเทียบเครื่องมือ



Bureau of Laboratory Quality Standards
Ministry of Public Health

This is to certify that

The Laboratory of

S.P.S. Consulting Service Co., Ltd.

**7 Soi Phaholyothin 24 , Phaholyothin Road , Jompol ,
Chatuchak , Bangkok 10900 , Thailand.**

has been accepted as an
accredited laboratory complying with the ISO/IEC 17025 : 2017
and the requirements of the Bureau of Laboratory Quality Standards

The laboratory has been accredited for specific tests
listed in the scope within the field of

Food Testing

Director of Bureau of Laboratory Quality Standards

Date of Accreditation : 20 June 2019

Valid Until : 19 June 2021

Accreditation Number 1280/60

The Laboratory of S.P.S. Consulting Service Co., Ltd. has been accepted as
accredited laboratory in the field of food testing for the following scopes.

No.	Type of Sample	Test	Method
1.	● Potable water - Drinking water in sealed container - Drinking water in non-sealed container ● Ice ● Non-Potable water - Processed water - Cooling water - Tap water - Ground water - Surface water - Swimming pool water ● Wastewater ● Seawater	1. Coliforms	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017 , part 9221 (B)
		2. Fecal coliforms	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017 , part 9221 (E)
		3. E.coli	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017 , part 9221 (F)

Bureau of Laboratory Quality Standards

1 of 3

Accreditation Number 1280/59

Issued : 00

Date of Accreditation : 20 June 2019

Date Issued : 20 June 2019

Valid Until : 19 June 2021

Reviewed by Head of Laboratory Accreditation Section...

The Laboratory of S.P.S. Consulting Service Co., Ltd. has been accepted as accredited laboratory in the field of food testing for the following scopes.

No.	Type of Sample	Test	Method
1.	- Potable water - Drinking water in scaled container - Drinking water in non-scaled container - Ice - Non-Potable water - Processed water - Cooling water - Tap water - Ground water - Surface water - Swimming pool water - Wastewater - Seawater	4. Total plate count	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017 , part 9215 (B)
		5. <i>Staphylococcus aureus</i>	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017 , part 9213 (B)
		6. <i>Pseudomonas aeruginosa</i>	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017 , part 9213(E)
		7. <i>Legionella</i>	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017, part 9260 (J)
	(continue)		

Bureau of Laboratory Quality Standards

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Issued : 00

Date Issued : 20 June 2019

Accreditation Number 1280/59

Date of Accreditation : 20 June 2019

Valid Until : 19 June 2021

Reviewed by Head of Laboratory Accreditation Section...

The Laboratory of S.P.S. Consulting Service Co., Ltd. has been accepted as accredited laboratory in the field of food testing for the following scopes.

No.	Type of Sample	Test	Method
1.	- Potable water - Drinking water in scaled container - Drinking water in non-scaled container - Ice - Non-Potable water - Processed water - Cooling water - Tap water - Ground water - Surface water - Swimming pool water - Wastewater - Seawater	8. <i>Salmonella</i> spp.	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017 , part 9260 (B)
		9. <i>Clostridium perfringens</i>	Standard Methods for the Examination of Water and Associated Materials, The Microbiology of Drinking Water (2010) , Environment Agency (EA) , UK
		10. Enterococci	Standard Methods for the Examination of Water and Wastewater. APHA , AWWA , WEF, 23 rd Edition, 2017 , part 9230 (C)
	(continue)		

Bureau of Laboratory Quality Standards

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Issued : 00

Date Issued : 20 June 2019

Accreditation Number 1280/59

Date of Accreditation : 20 June 2019

Valid Until : 19 June 2021

Reviewed by Head of Laboratory Accreditation Section...



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202307315-0001

Date Issued : 04-Aug-23

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment : Block Digestion (Gerhardt, TR)

Manufacturer : Gerhardt

Model : -

Serial No. : 4061832

ID No./Tag No. : KJ 01/43

Date Received : 27-Jul-23

Date Calibrated : 02-Aug-23

Calibrated by : [REDACTED]

Calibration Method or Calibration Procedure Used

In-house method : CP-49 base on TLAS G-20 by comparing against Standard Thermometer.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:



Page 1 of 2

Certificate No. : L202307315-0001

Environment : Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$

Relative Humidity : $(50 \pm 15)\%\text{RH}$

Calibration Temperature ($^{\circ}\text{C}$)	Setting Temperature ($^{\circ}\text{C}$)	Indicating Temperature ($^{\circ}\text{C}$)	Measured Stability ¹ ($^{\circ}\text{C}$)	Measured Uniformity ² ($^{\circ}\text{C}$)	Overall Variation ³ ($^{\circ}\text{C}$)
380	380	380	0.68	2.44	4.24

Calibration Temperature ($^{\circ}\text{C}$)	Standard Reading ($^{\circ}\text{C}$), Probe No. 20 is Reference Probe					Uncertainty ⁴ ($\pm^{\circ}\text{C}$)
380	No. 1	No. 2	No. 3	No. 4	No. 5	1.7
	378.41	378.85	377.25	377.79	378.29	
	No. 6	No. 7	No. 8	No. 9	No. 10	
	378.27	377.21	377.76	379.64	379.54	
	No. 11	No. 12	No. 13	No. 14	No. 15	
	378.18	379.62	378.53	379.15	378.98	
	No. 16	No. 17	No. 18	No. 19	No. 20	
	379.59	378.98	380.28	378.60	378.43	

Without adjustment

No.1	No.6	No.11	No.16
No.2	No.7	No.12	No.17
No.3	No.8	No.13	No.18
No.4	No.9	No.14	No.19
No.5	No.10	No.15	No.20

Top view position

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202302323-002 for Digital Thermometer with Probe (Agilent) Module 2 (172) Type K Serial No. US37011204, Due 09-Sep-23

- Notes :
1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
 2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.
 3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
 4. The uncertainty of measurement is included temperature stability.

End of Certificate

Certificate of Calibration

Certificate No. : 66-420115-1

Page : 1 of 2

Submitted by : M E T Company Limited

36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : pH Meter with electrode

pH meter

Manufacturer : Hanna

Model : HI8424

Range : N/A pH

Resolution : 0.01 pH

Serial No. : 06160185101

ID No. : MET-pH08/64

Electrode

Model : HI1230

Serial No. : 0937487N

Environment : Ambient Temperature : $(25 \pm 2) ^\circ \text{C}$

Relative Humidity : $(50 \pm 15) \%$

Date of Received : 16 November 2023

Date of Calibration : 23 November 2023

Date of Issue : 23 November 2023

Calibrated by :

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
440001	23E1240	24 Mar 2025	National Institute of Metrology Thailand (NIMT)

2. Certified Reference Material (CRM)

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61270213	915161	19 Jul 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.985	61275614	898428	28 May 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
9.997	61281073	915163	19 Jul 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-420115-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

Performing standard curve by Multiproduct Calibrator at pH (4,7) and (7,10)

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7	177.4800	4	4.00	177.4	0.1	0.060
	0.0000	7	7.00	0.0	0.0	0.058
7,10	0.0000	7	7.00	0.0	0.0	0.058
	-177.4800	10	10.00	-177.4	-0.1	0.060

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7) and (7,10)

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7	4.008	4.01	0.00	0.0091
	6.985	7.01	-0.02	0.012
7, 10	6.985	7.01	-0.02	0.012
	9.997	10.01	-0.01	0.014

Remark

UUC : Unit Under Calibration

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

This reported uncertainty of measurment 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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Certificate of Calibration

Certificate No. : 66-400650-1

Page : 1 of 2

Submitted by : M E T Company Limited
36/659 Moo 6, T. Bangrakpattana, A. Bangbuatong, Nonthaburi 11110

Equipment : Digital Thermometer with NTC Probe
Temperature Indicator

Manufacturer : Hanna

Model : HI8424

Range : N/A

Resolution : 0.1 °C

Serial No. : 06160185101

ID No. : MET-pH08/64

NTC Probe

Model : HI7662

Sheath Material : Stainless

Diameter : 3.5 mm.

Length : 115 mm.

Serial No. : 09020C2N

ID No. : MET-pH08/64

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Line Voltage : (220 ± 22) VAC

Date of Received : 16 November 2023

Date of Calibration : 22 November 2023

Date of Issue : 22 November 2023

Calibrated by : [Redacted]

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0016-22	07 Feb 2024	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)
400004	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)

Approved by

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400650-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Immersion Depth (mm.)	Standard Reading (° C)	UUC Reading (° C)	Correction (° C)	Uncertainty (± ° C)
100	10.0040	10.0	0.0	0.11
100	30.0052	30.0	0.0	0.11
100	49.9966	50.0	0.0	0.11

Remark

UUC : Unit Under Calibration

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

This 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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Certificate of Calibration

Certificate No. : 66-400476-5

Page : 1 of 2

Submitted by : M E T Company Limited
36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Air Chamber (Incubator)
Manufacturer : M-LAB Model : BIC-140
Range : N/A °C Resolution : 0.1 °C
Serial No. : 240412 ID No. : MET-BI01/55

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (31.0 to 32.0) °C
Relative Humidity : (55 to 60) %
Line Voltage : (210.0 to 210.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

Calibrated by : [Redacted]

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with RTD Probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400043	66-400226-1	27 Oct 2023	National Institute of Metrology Thailand (NIMT)

Approved by : [Redacted]

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400476-5

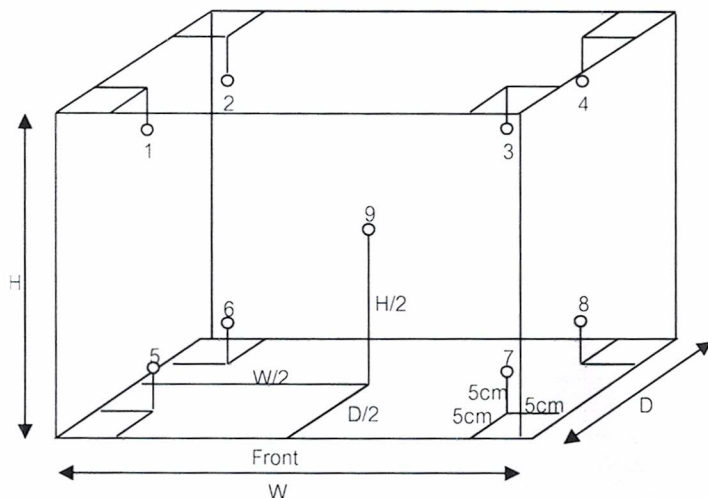
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.37 m

D = 0.33 m

H = 1.14 m

Capacity = 0.14 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
20.0	20.0	20.0	19.94	19.63	19.66	19.60	20.31	20.38	20.27	20.01	20.22	0.34

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	20.0	20.0	0.68	0.05	0.9

Remark The uncertainty is not combine uniformity of the air chamber

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

This 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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Certificate of Calibration

Certificate No. : 66-400476-3 **Page : 1 of 2**

Submitted by : M E T Company Limited
36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Air Chamber (Refrigerator)
Manufacturer : Sanden Intercool Model : YPR-068S
Range : N/A °C Resolution : 1 °C
Serial No. : YPR0659S-141200060R ID No. : MET-RE03/59

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (29.5 to 30.5) °C
Relative Humidity : (54 to 57) %
Line Voltage : (220.5 to 221.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

Calibrated by : [Redacted]

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with Thermocouple probe

ID No.	Cert. No.	Due Date	Traceability
400046 & 400028	66-400184-3	04 Oct 2023	National Institute of Metrology Thailand (NIMT)

Approved by : [Redacted]

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400476-3

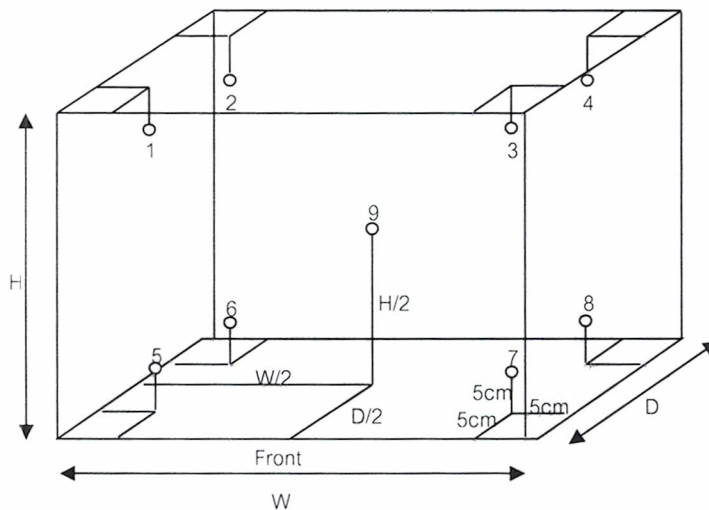
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.58 m

D = 0.60 m

H = 1.45 m

Capacity = 0.50 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
3	3	3	4.3	4.1	4.3	4.3	2.9	3.4	3.0	3.4	3.3	0.83

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
3	3	3	1.1	0.1	1.7

Remark The uncertainty is not combine uniformity of the air chamber

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

This 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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Certificate of Calibration

Certificate No. : 66-400476-2

Page : 1 of 2

Submitted by : M E T Company Limited

36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Air Chamber (Oven)

Manufacturer : Binder

Model : ED53

Range : N/A °C

Resolution : 1 °C

Serial No. : 13-07419

ID No. : MET-OV02/57

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited

Ambient Temperature : (31.0 to 32.0) °C

Relative Humidity : (55 to 60) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

Calibrated by :

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Digital Thermometer with Thermocouple probe

ID No.

Cert. No.

Due Date

Traceability

400029 & 400030 66-400227-1

24 Oct 2023

National Institute of Metrology Thailand (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400476-2

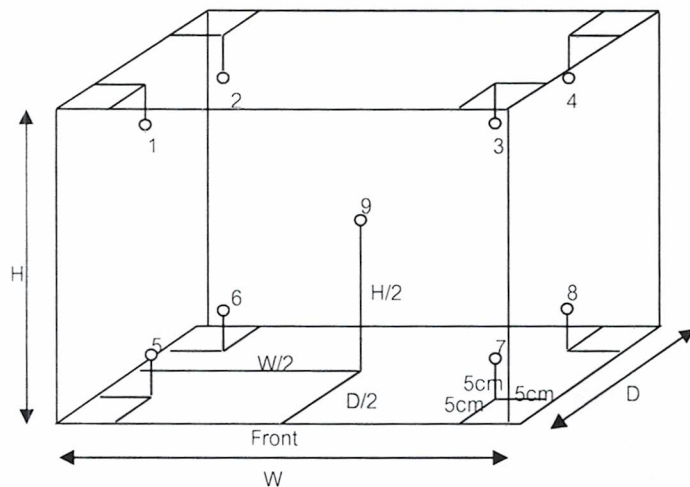
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.40 m

D = 0.33 m

H = 0.40 m

Capacity = 0.05 m³

Test Point (° C)	Setting Temperature (° C)	Indicating Temperature (° C)	Measured Temperature (° C) @ Sensor No.									Uncertainty (± ° C)
			1	2	3	4	5	6	7	8	9	
104	110	110	105.0	105.0	105.0	104.9	103.9	103.9	104.2	104.2	104.2	0.94
180	184	184	180.1	181.9	180.8	179.7	180.2	180.8	180.7	180.8	180.2	1.2

Test Point (° C)	Setting Temperature (° C)	Indicating Temperature (° C)	Measured Uniformity (° C)	Measured Stability (° C)	Overall Variation (° C)
104	110	110	1.0	0.2	1.3
180	184	184	1.9	0.3	2.7

Remark The uncertainty is not combine uniformity of the air chamber

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

This 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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Certificate of Calibration

Certificate No. : 66-400476-1

Page : 1 of 2

Submitted by : M E T Company Limited
36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Air Chamber (Oven)
Manufacturer : Memmert Model : UM 100
Range : N/A °C Resolution : 0.1 °C
Serial No. : b197.0985 ID No. : MET-OV01/46

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (31.0 to 32.0) °C
Relative Humidity : (55 to 60) %
Line Voltage : (210.0 to 210.8) V

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 23 August 2023

Calibrated by :

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with Thermocouple probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400032	66-400228-1	25 Oct 2023	National Institute of Metrology Thailand (NIMT)

Approved by :

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-400476-1

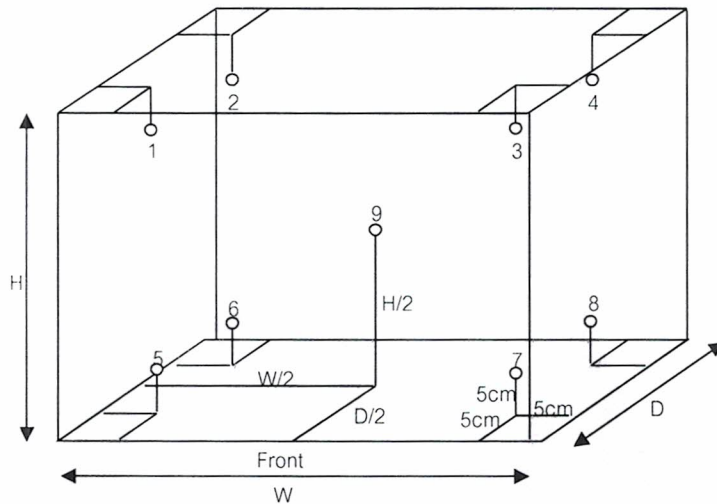
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber

W = 0.32 m

D = 0.18 m

H = 0.24 m

Capacity = 0.01 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
180.0	180.0	180.0	181.7	180.1	180.5	180.7	181.5	181.7	181.3	181.4	180.1	0.95

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
180.0	180.0	180.0	1.7	0.2	2.0

Remark The uncertainty is not combine uniformity of the air chamber

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

This 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%

- o0o -



Calibration Certificate

Cert. No. : CT-23-10-23746

Page : 1 of 4

Issued date : 18/10/2023

Equipment : COD Reactor , Manufacturer : MLAB , Model : DB1602
S/N = 0169 , Customer ID = -

Client : M E T COMPANY LIMITED.

36/659 M.6 Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11110

Received Date : 10 October 2023

Ref. Job No. : SO6610-00020

Calibrate by :

Cert. prepare by :

Calibrated Date : 10 October 2023

Approved by :

Calibration Place : Laboratory of Metrology Technical Co.,Ltd.

Environment Condition : Temperature 26.2 ± 0.8 (°c) , Humidity 65.5 ± 7.5 (%RH)

Calibration Method : Measure temperature distribution by 9 channel in flat level. , (MTEC WI No. # WICAL-02-005-R01)

Reference Standard Instrument :

No	Instrument	code	Model	Due date
1	Temperature Datalogger	MTEC-CE-0180	MLAB	10/2023
2	Thermo Hygrometer	MTEC-CE-0181	TP-50	06/2024

Condition of certificate :

(1) This certificate is traceable to International System of units (SI Units). , (2) This certificate was certified only for the instrument we calibrated. , (3) This result of calibration was found accurate as show on date and place of calibration only. , (4) The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k =$ (see result table) , providing a level of confidence of approximately 95%. , (5) This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Division, Metrology Technical Co.,Ltd.



Approved Signatory

CER04-R01-DF01

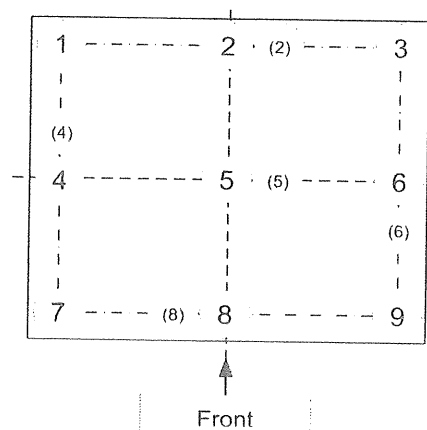
Certificate No. : CT-23-10-23746

Calibration Result :

Page : 2 of 4

Condition of UUC :

- 1) Without Adjustment
- 2) Immersion : $\frac{1}{2}$ of the depth of the hole



Pic 1 : Position of each sensor No.

Section 1 : Report of Temperature distribution

Unit : (°C)

[illegible]

(*) = The average of 30 values in each point , (**) = Coverage factor (k) value

Section 2: Report of Chamber Performance

Unit : (°C)

Calibration Point	UUC Setting	UUC Reading ^(°)	Temperature Uniformity	Temperature Stability (± °C)	Temperature Overall Variation
150	150	150	1.11	0.05	1.61

(*) = The average of 30 values in each point

Approved Signatory :

Certificate No. : CT-23-10-23746

Page : 3 of 4

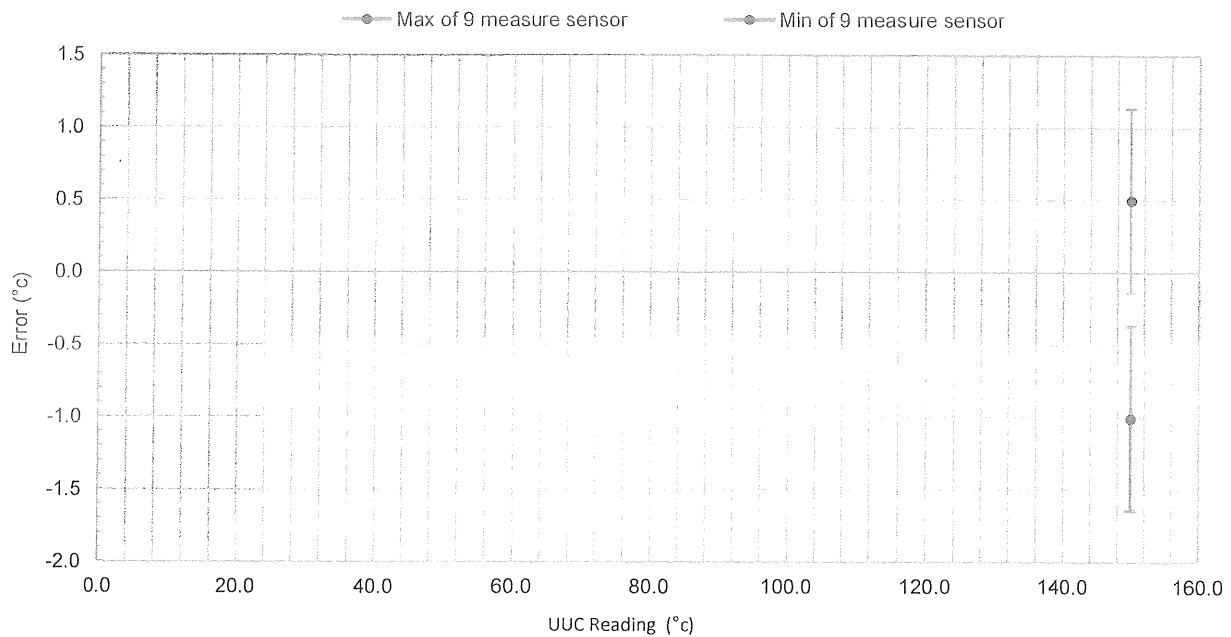
Section 3 : Possible of temperature. Show minimum and maximum of the average values and Include with uncertainty of measurement. The average values is average of each position standard sensor throughout observation time.

Unit : (°C)

Calibration Point	UUC Setting (*)	UUC Reading (*)	Possible of Minimum temperature	Possible of Maximum temperature
150	150	150	148.86	151.64

(*) = The average of 30 values in each point

Section 4 : Trend of accuracy



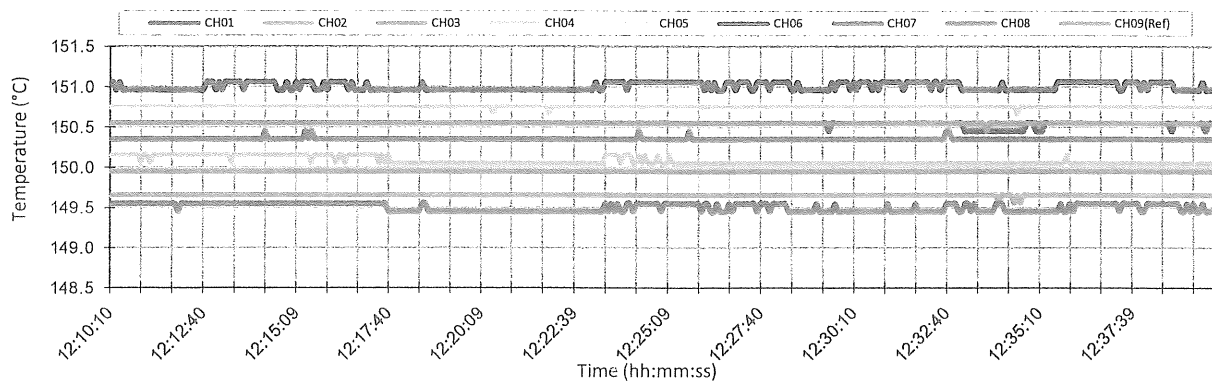
Approved Signatory :

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Section 5 : Graph report for Temperature distribution , not include uncertainty of measurement

(5.1) Temperature Distribution at UUC Reading 150 °C



Approved Signatory :

[Redacted Signature]

Certificate of Calibration

Certificate No. : 66-200271-1

Page : 1 of 2

Submitted by : M E T Company Limited
36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Electronic Balance
Manufacturer : Sartorius Model : BSA224S-CW
Serial No. : 35090472 ID No. : MET-EB 02/60
Capacity : 220 g Resolution : 0.0001 g

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited
Ambient Temperature : (25.0 to 25.6) °C
Relative Humidity : (52.3 to 55.6) %
Air Pressure : 1005.0 mbar

Date of Received : 23 August 2023

Date of Calibration : 23 August 2023

Date of Issue : 25 August 2023

Calibrated by :

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref : LAB 14
Edition 7 - November 2022

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C0222345	10 Nov 2023	National Institute of Metrology (Thailand), (NIMT)

Approved by :

Laboratory Manager

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 Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 66-200271-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

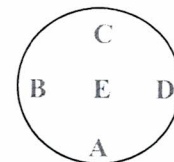
Nominal Value (g)	Correction (g)	Uncertainty $\pm$ (g)
0.05	0.0000	0.00011
0.1	0.0000	0.00011
0.5	0.0001	0.00011
1	0.0000	0.00011
5	0.0000	0.00011
10	0.0001	0.00012
50	0.0001	0.00014
100	0.0001	0.00020
150	0.0001	0.00038
200	0.0000	0.00038

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.11$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g
 A B C D E
 0.0001 0.0001 0.0001 0.0001 0.0000 g



Repeatability

Load test : 200 g
 Stdev. : 0.00005 g

- o0o -



Packing List

Unit : K-446 Kjeldigester standard



151111112791000281006111

Serial Number 1000281006

Page 1(1)

Item	Pieces	Description		
11059833	1.0000	Packing parts Kjeldigester K-446/K-449 Beipackteile K-446/K-449		✓ OK
037377	5.0000	Sample tubes 300 ml (set of 4) Probengläser 300 ml (Set à 4 Stück)		✓ OK
11059754	1.0000	Rack 20 cpl. Rack 20 kpl.		✓ OK
11058955	1.0000	Aspiration device Kjeldigester K-446/K-449 cpl. Absaugeinheit K-446/K-449		✓ OK
040444	1.0000	Weighing boat 20pcs. Wägeschiffchen 20 Stk.		✓ OK
010020	1.0000	Power cable type USA, 3 pole 120V Anschlusskabel USA W 120V		✓ OK
11058825	1.0000	Fume collection tube with ball joint Dampfsammelrohr mit Kugelschliff		✓ OK
11592548	1.0000	Kjeldahl Practice Guide en Kjeldahl Practice Guide en		✓ OK
11593546	1.0000	Operation Manual K-446/K-449 english Bedienungsanleitung K-446/K-449 englisch		✓ OK
11593635	1.0000	Supplemantary sheet Kjeldigester K-446/K-449 Beiblatt K-446/K-449		✓ OK

Packed by





BUCHI Certificate Final Test Inspection

Unit : BÜCHI Kjeldigester K-446

Serial number 1000281006

Examination Procedure

1. Visual control of the glass parts and the unit

✓ OK

- No scratches on the coated surface
- Mounted in accordance to the specific drawing

2. Security tests

✓ OK

- High voltage test in accordance with EN 61010-1 (IEC 1010)
- Ground connection test in accordance with EN 61010-1 (IEC 1010)

3. Functional tests

Operating panel

✓ OK

- All buttons are working
- Cooling system is working after the instrument has been switched on

Connector plugs

✓ OK

- Scrubber connector is working

Heating element

✓ OK

- Heating-up temperature 420 °C is reached after 40 minutes
- Temperature calibration at 420 °C (3 measuring points)

4. Completeness of order checked

✓ OK

BÜCHI Labortechnik AG hereby declares that this unit is in accordance with the specifications



H.-P. Gohn, Quality Manager

Signature, Date:



Packing List

Unit : K-415 TripleScrub 230V



151111112781000281005111

Serial Number

1000281005

Page 1(1)

Item	Pieces	Description		
11057332	1.0000	Tray for adsorption storage Ablage für Adsorption		✓ OK
048355	1.0000	Silicone hose D6/9 L=3m Silikonschlauch D6/9 L=3.0m		✓ OK
033701	1.0000	Glass wool 30g Glaswolle 30g		✓ OK
028737	2.0000	Hose clamp Anschlussklemme		✓ OK
11064971	1.0000	Activated Charcoal 2-6mm, 150g Aktivkohle 2-6mm, 150g		✓ OK
010020	1.0000	Power cable type USA, 3 pole 120V Anschlusskabel USA W 120V		✓ OK
11593505	1.0000	Operation Manual K-415 english Bedienungsanleitung K-415 englisch		✓ OK

Packed by





BUCHI Certificate Final Test Inspection

Unit : BÜCHI Scrubber K-415

Serial number 1000281005

Examination Procedure

1. **Visual control of the glass parts and the unit**

✓ OK

- No scratches or splinters on the glass parts
- Mounted in accordance to the specific drawing

2. **Security tests**

✓ OK

- High voltage test in accordance with EN 61010-1 (IEC 1010)
- Ground connection test in accordance with EN 61010-1 (IEC 1010)

3. **Functional tests**

Vacuum test

✓ OK

- Bypass valve open: Pressure is 0 - 65 mbar below the atmospheric pressure
- Bypass valve closed: Pressure is 400 mbar (+/- 10 %) below the atmospheric pressure

4. **Completeness of order checked**

✓ OK

BÜCHI Labortechnik AG hereby declares that this unit is in accordance with the specifications


H.-P. Gohn, Quality Manager

Signature, Date: 

Packing List

Unit : K-360 Plastik Basic



151111113001000281014111

Serial Number

1000281014

Page 1(1)

Item	Pieces	Description		
043410	3.0000	Canister 10L thin-walled Kanister 10L dünnwandig		OK
043603	1.0000	Packing parts K-360 Beipackteile K-360		OK
047871	1.0000	Suppl. sheet distillation unit Beiblatt Distillation Unit		OK
010020	1.0000	Power cable type USA, 3 pole 120V Anschlusskabel USA W 120V		OK
11592548	1.0000	Kjeldahl Practice Guide en Kjeldahl Practice Guide en		OK
093176	1.0000	Operation Manual K-360 english Bedienungsanleitung K-360 englisch		OK

Packed by





BUCHI Certificate Final Test Inspection

Unit : BÜCHI BÜCHI Kjelflex K-360

Serial number 1000281014

Examination Procedure

1. **Visual control of the glass parts and the unit** ✓ OK

 - No scratches on the coated surface or splinters on the glass parts
 - Mounted in accordance to the specific drawing
2. **Security tests** ✓ OK

 - High voltage test in accordance with EN 61010-1:2002 (IEC 61010-1, VDE 0411)
 - Ground connection test in accordance with EN 61010-1:2002 (IEC 61010-1, VDE 0411)
 - Safety door sensor checked
3. **Functional tests** ✓ OK

Electronics

 - Electronic modul is tested with the checking device PG157
 - Connector plugs are working

Operating panel ✓ OK

 - Display is working
 - All buttons of the keypad are working

Pump testing ✓ OK

 - All pumps are working
 - All pumps (exception: water pump of the steam generator) are precalibrated

Valve testing ✓ OK

 - All valves are working

Steam generator testing ✓ OK

 - The steam generator is filled with water
 - The steam generator valve is working
 - The amount of distillate corresponds to specifications

Further testing ✓ OK

 - Beeper is working
4. **Unit configuration and completeness of order checked** ✓ OK

BÜCHI Labortechnik AG hereby declares that this unit is in accordance with the specifications



H.-P. Gohn, Quality Manager

Signature, Date:

