
บริษัท วิศวกรรมธรณีและฐานราก จำกัด

CERTIFICATE OF CALIBRATION

Certificate No.: B1-2409029/22

Page 1 of total 4 pages

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	Electronic Balance		
Manufacturer	MEMMERT TOLEDO	Model	AE200S
Serial No.	P280028	ID No.	-
Description	Maximum Capacity: 205 g	Resolution:	0.0001 g

Environmental Conditions Ambient Temperature: 25 °C
Relative Humidity: 62 %
Atmospheric Pressure: -

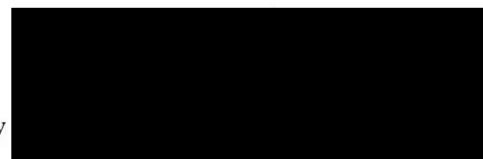
Calibration Location LAB
Received Date 24 September 2022
Calibration Date 24 September 2022
Date of Issue 26 September 2022
Condition of the artifacts Good Conditions

Checked by



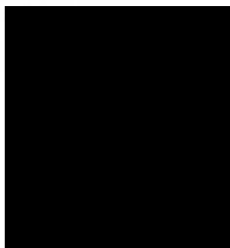
Act as Technical Manager

Approved by

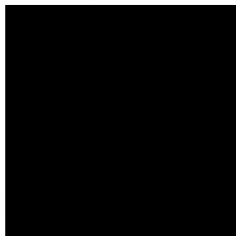


Representative of Managing Director

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(Dr. Ekachai Puttitwong)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.

Certificate No.: B1-2409029/22

Page 2 of total 4 pages

Reference Method:

- The calibration method used was CP-208 based on UKAS LAB 14
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set 1 mg - 1 kg	-	B916537870	MM-0018-21	Mar. 9, 2023	NIMT

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).

Measurement Results:

- ☒ Without Adjustment
☐ After Adjustment

1. Repeatability

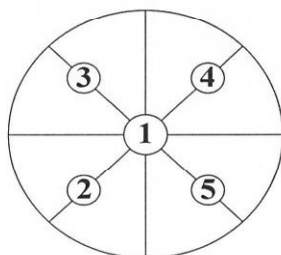
Nominal Weight	Standard Deviation of Reading (g)
200	0.00005

Certificate No.: B1-2409029/22

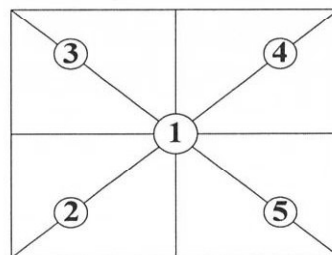
Page 3 of total 4 pages

Measurement Results (Cont.):

2. Off-Center Loading



Front



Front



Measuring Positions

Measuring Positions	Instrument Reading (g)	Max. Difference (g)
1	50.0000	0.000
2	50.0002	
3	50.0001	
4	50.0000	
5	50.0001	
1	50.0001	

3. Error of indication from nominal value

Standard Weight (g)	Instrument Reading (g)		Correction (g)	Uncertainty of Measurement (g)
	Without Adjustment	After Adjustment		
1.00000	1.0000	-	0.0000	± 0.00011
2.00000	2.0000	-	0.0000	± 0.00011
5.00001	5.0000	-	0.0000	± 0.00011
10.00003	10.0000	-	0.0000	± 0.00011
15.00004	15.0000	-	0.0000	± 0.00012
20.00003	20.0000	-	0.0000	± 0.00012
50.00003	50.0000	-	0.0000	± 0.00013
100.00005	99.9999	-	0.0002	± 0.00018
150.00008	150.0001	-	0.0000	± 0.00028
200.00005	200.0000	-	0.0001	± 0.00028

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REV.02 02/24/21

Certificate No.: B1-2409029/22

Page 4 of total 4 pages
Measurement Results (Cont.):
4. Effect of Tare

Nominal Tare Weight (g)	Standard Weight (g)		Instrument Reading (g)	Instrument Deviation (g)
50	Tare		0.0000	0.0000
	at 20 %	10.0000	10.0000	0.0000
	at 40 %	20.0000	20.0001	0.0001
	at 60 %	50.0000	50.0001	0.0001
	at 80 %	100.0000	99.9999	-0.0001
	at 100 %	150.0000	150.0001	0.0001

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

CERTIFICATE OF CALIBRATION

Certificate No.: T1-2409018/22

Page 1 of total 3 pages

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	Refrigerator		
Manufacturer	ACCUPLUS	Model	i250
Serial No.	0408-0115-0002	ID No.	-
Description	Resolution of UUC : 0.1 °C		

Environmental Conditions

Ambient Temperature:	25.7 °C
Relative Humidity:	66 %
Atmospheric Pressure:	-

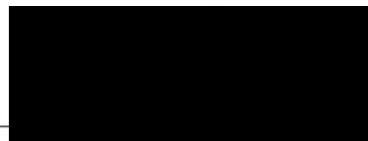
Calibration Location Laboratory

Received Date 24 September 2022

Calibration Date 24 September 2022

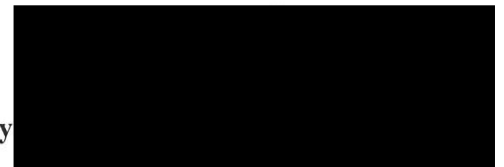
Date of Issue 26 September 2022

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Certificate No.: T1-2409018/22

Page 2 of total 3 pages
Reference Method:

- The calibration method used was CP-084 based on TLAS G-20-1/02-08 (E).
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Data Logger with Sensors	34972A/ 34901A	MY59001842/ US37245625	I0-1909001/22	Sep. 20, 2023	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.

Measurement Results: (X) Without Adjustment
Reporting of Temperature Distribution

UUC Reading (°C)	Measured Temperature (°C) @ sensor No. (Sensor No. 9 is Ref.)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9	
4.0	4.53	4.37	4.23	3.98	4.00	3.86	3.87	3.92	3.82	0.20

Reporting of Chamber Performance

Setting Temperature (°C)	UUC Reading (°C)	Uniformity (°C)	Stability (°C)	Overall Variation (°C)
4.0	4.0	0.93	0.42	1.38

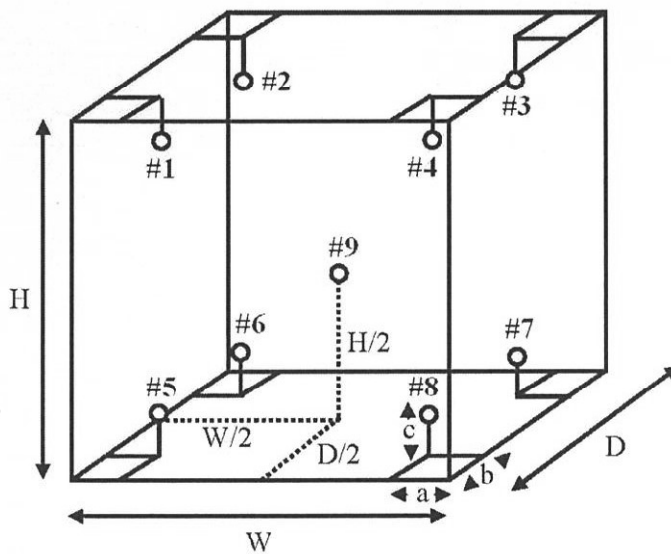
UUC: Unit Under Calibration

Certificate No.: T1-2409018/22

Page 3 of total 3 pages

Measurement Results (Cont.):

Sensor Installation



Working space :

W x H x D 48 cm.x 105 cm.x 49 cm.

a x b x c 5 cm.x 5 cm.x 5 cm.

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

CERTIFICATE OF CALIBRATION

Certificate No.: T1-2409016/22

Page 1 of total 3 pages

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	Water Bath		
Manufacturer	Memmert	Model	WB 14
Serial No.	1496.0239	ID No.	-
Description	Resolution of UUC : 0.1 °C		

Environmental Conditions Ambient Temperature: 27.5°C
Relative Humidity: 61%
Atmospheric Pressure: -

Calibration Location Laboratory
Received Date 24 September 2022
Calibration Date 24 September 2022

Date of Issue 26 September 2022

Checked by



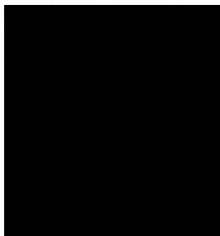
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Certificate No.: T1-2409016/22

Page 2 of total 3 pages
Reference Method:

- The calibration method used was CP-085 based on an ASTM E715-80 (Reapproved 2016).
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Data Logger with Sensors	34970A/ 34901A	MY59002053/ MY41166066	I0-0401004/22	Jan. 5, 2023	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.

Measurement Results: (X) Without Adjustment

Reporting of Temperature Distribution

UUC Reading (°C)	Measured Temperature (°C) @ sensor No. (Sensor No. P5 is Ref.)					Uncertainty (± °C)
	P1	P2	P3	P4	P5	
95.0	95.75	95.82	95.81	95.59	95.81	0.10

Reporting of Chamber Performance

Setting Temperature (°C)	Uniformity (°C)	Stability (°C)
95.0	0.27	0.04

UUC: Unit Under Calibration

Calibrated by

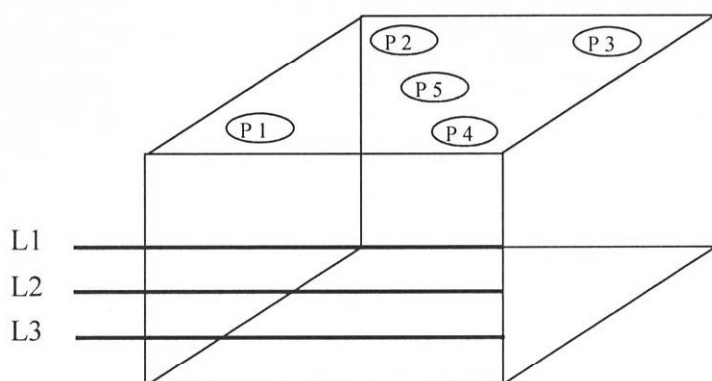


Certificate No.: T1-2409016/22

Page 3 of total 3 pages

Measurement Results (Cont.):

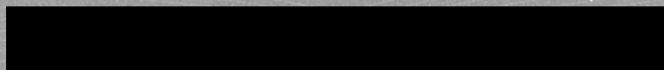
Sensor Installation



L2 = 95 mm.

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



CERTIFICATE OF CALIBRATION

Certificate No.: C0-2309006/22

Page 1 of total 2 pages

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	Turbidimeter		
Manufacturer	HACH	Model	2100N
Serial No.	960400002448	ID No.	-
Description	-		

Environmental Conditions Ambient Temperature: $(20 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 10) \%$
Atmospheric Pressure: -

Calibration Location Jayhawks Laboratory (CL&GL)

Received Date 23 September 2022

Calibration Date 24 September 2022

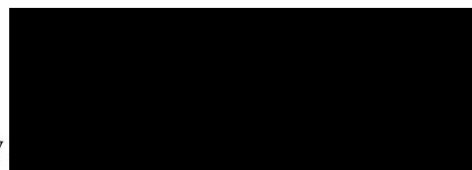
Date of Issue 26 September 2022

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Certificate No.: C0-2309006/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-182 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard :

Material	Batch Value	Lot No.	Due Date	Traceability
Turbidity Standard Solution	20 NTU	800627	May 3, 2023	CPA chem
	200 NTU	800629	May 31, 2023	
	1000 NTU	800633	May 7, 2023	

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- CPA chem Ltd.

Measurement Results:

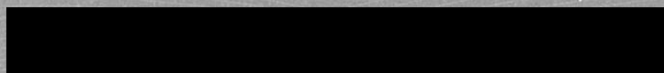
Unit : NTU

Turbidity Standard Solution	Measured Value	Correction	Uncertainty (±)
0.1	0.103	-0.003	-
20	20.3	-0.3	0.13
200	200	0	1.3
1000	1001	-1	8.1

Note : Adjustment points: 0.1 NTU 20 NTU 200 NTU 1000 NTU

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



CERTIFICATE OF CALIBRATION

Certificate No.: C0-2309003/22

Page 1 of total 2 pages

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	pH Meter		
Manufacturer	HANNA	Model	HI991001
Serial No.	TA04410072	ID No.	-
Description	Range : 0 - 14 pH, Resolution : 0.01 pH		

Environmental Conditions

Ambient Temperature:	(20 ± 2) °C
Relative Humidity:	(50 ± 10) %
Atmospheric Pressure:	-

Calibration Location Jayhawks Laboratory (CL&GL)

Received Date 23 September 2022

Calibration Date 24 September 2022

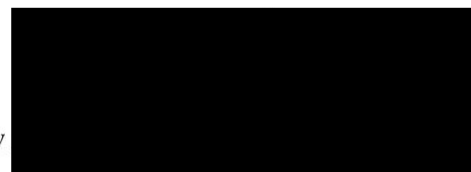
Date of Issue 26 September 2022

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Certificate No.: C0-2309003/22

Page 2 of total 2 pages
Reference Method:

- The calibration method used was CP-178 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard:

Type	pH Value	Lot No.	Due Date	Traceability
pH Standard Solution	4.01	081020	Mar. 6, 2023	NIMT
	7.01	020221	Mar. 1, 2023	
	10.00	091020	Feb. 7, 2023	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	I0-1006004/22	Jun. 9, 2023	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:
Calibration of pH Electrode (Serial No.: 0845025N)

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	4.00	166	0.013
7.01	7.02	-9	0.013
7.01	7.03	-9	0.013
10.00	10.03	-178	0.013

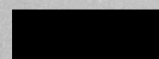
Note : Adjust Curve to Buffer Solution pH (7,4) , (7,10)

 Temperature stability of micro bath : $25 \pm 0.2^{\circ}\text{C}$

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by



CERTIFICATE OF CALIBRATION

Certificate No.: C0-2309005/22

Page 1 of total 2 pages

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment Salinty Refractometer
Manufacturer YSI **Model** EC300
Serial No. JC00735 **ID No.** -
Description Range : 0-70 ppt, Resolution : 0.1 ppt

Environmental Conditions Ambient Temperature: $(20 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 10) \%$
Atmospheric Pressure: -

Calibration Location Jayhawks Laboratory (CL&GL)

Received Date 23 September 2022

Calibration Date 24 September 2022

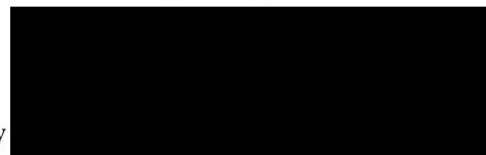
Date of Issue 26 September 2022

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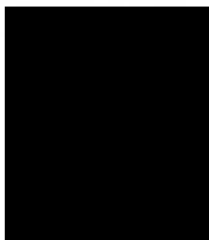
Act as Technical Manager

Approved by

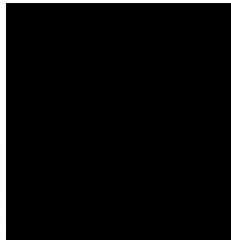


Representative of Managing Director

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Certificate No.: C0-2309005/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-184 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Analytical Balance	XPR206CDR	C009071943	10-2302003/22	Feb. 22, 2023	THC
Sodium Chloride	-	-	823331	Jun. 18, 2025	CPA chem

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.
- CPA chem Ltd.

Measurement Results:

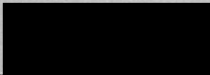
Unit : ppt

Standard Test Point	UUC Reading	Correction	Uncertainty (\pm)
0.5	0.5	0.0	0.058
5.0	5.2	-0.2	0.058
20.0	21.0	-1.0	0.058

UUC : Unit Under Calibration.

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k=2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by 

CERTIFICATE OF ANALYSIS

Equipment : DO Meter

Meter Model : HI9146-04 **Serial No. :** 626680

Probe Model : HI76407/4F **Serial No. :** KC1N16T6N

Manufacturer : Hanna Instruments

Made in : Romania

Condition As-Received : Used Product

Reference : RE221479

Customer name : Geotechnical & Foundation Engineering Co., Ltd.
151 Nuan Chan Road, Nuan Chan, Bueng Kum,
Bangkok 10230

Received date : 27 September 2022

Calibrate date : 30 September 2022

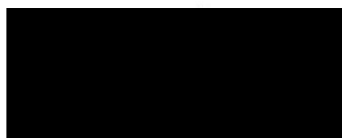
Issue date : 30 September 2022

Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15) % RH

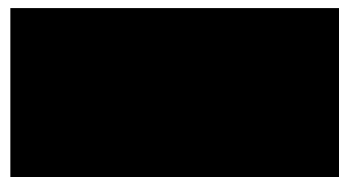
Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibrated by :



Calibration Engineer

Approved by :



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)

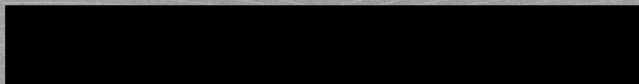
Condition of this result of analysis**Standard Dissolved Oxygen Buffer Solution :**

Zero Oxygen Solution	Model No.	Mean Value	Ref. No.	Lot Number	Exp. date
HI7040L	HI7040L	$0.0 \pm 0.1 @ 25^{\circ}\text{C}$	01B24	S0008/22	January 2027

Analysis result :

Standard Solution	Applied Value	Before Adj.	After Adj.
0.0 mg/L (HI7040L)	0.0 mg/L	0.00 mg/L	- mg/L
Air Saturate 100%	100%	98.4 %	100.0 %

**** End of certificate ****



CERTIFICATE OF CALIBRATION

Certificate No.: C0-2309004/22

Page 1 of total 2 pages

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	Conductivity Meter		
Manufacturer	YSI	Model	EC300
Serial No.	JC00735	ID No.	-
Description	-		

Environmental Conditions Ambient Temperature: $(20 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 10) \%$
Atmospheric Pressure: -

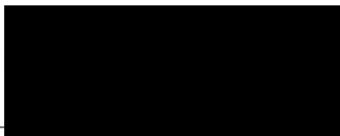
Calibration Location Jayhawks Laboratory (CL&GL)

Received Date 23 September 2022

Calibration Date 24 September 2022

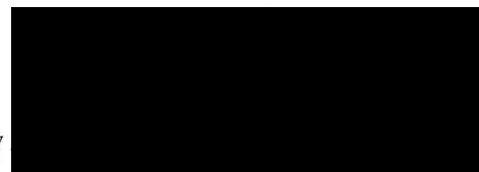
Date of Issue 26 September 2022

Checked by



Act as Technical Manager

Approved by

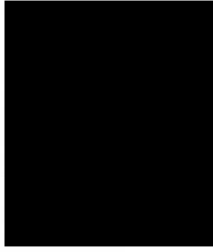


Representative of Managing Director

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Certificate No.: C0-2309004/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-177 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard :

Meterial	Batch Value	Lot Number	Due Date	Traceability
Conductivity Standard Solution	25 μ S/cm	823332	Jun. 20, 2023	CPA chem
	1.421 mS/cm	S220112015	Aug. 10, 2023	SCP Science
	110.88 mS/cm	S220120021	May 23, 2023	SCP Science

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- CPA chem Ltd.
- SCP Science.

Measurement Results:

Conductivity Standard Solution	Measured Value	Correction	Uncertainty (\pm)
25 μ S/cm	26.0 μ S/cm	-1.0 μ S/cm	0.28 μ S/cm
1.421 mS/cm	1.422 mS/cm	-0.001 mS/cm	0.0052 mS/cm
110.88 mS/cm	110.8 mS/cm	0.1 mS/cm	0.29 mS/cm

Note : Adjustment points: 25 μ S/cm 1.421mS/cm 110.88mS/cm

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Instrument Quality Certificate

Instrument:
HI98192

SN:
07220006101

Software version:
1.4

Description: EC / TDS / NaCl / Resistivity / Temperature Meter

Hanna Instruments certifies that this instrument has been produced, calibrated and tested to meet all applicable Hanna Instruments procedures, using standards and reference instruments, the accuracy of which is traceable to the National Institute of Standards (NIST) in the USA or to internationally acceptable national physical standards. The standards and reference instruments used in calibration and testing are supported by a calibration system which meets requirements of ISO 9001. The following tests have been performed according to the test instruction QC_HI98192, Rev.0.7

The results are listed below:

Standard Reference Materials: EC / TDS: SRM999 [NIST]
External Reference Devices*: Ω : SN 06111204 [resistors box, IET]
 $^{\circ}\text{C}$: NTO-031 [NIST Certified Thermometers Set]
Factory calibration: EC: 2022.05.30 $^{\circ}\text{C}$: 2022.05.30
Supplied with the following probes: HI763133

A) Tests performed using reference devices:

Temperature:	RES [Ω], 0.1%:	32650	10000	3603	680.0	
	Tolerance [$^{\circ}\text{C}$]:	0.0 ± 0.2	25.0 ± 0.2	50.0 ± 0.2	100.0 ± 0.2	
	Reading EC [$^{\circ}\text{C}$]:	0.0	25.0	50.0	100.0	Passed
EC	EC [$\mu\text{S}/\text{cm}$]:	0.000	0.00	0.05	-NA-	
[with simulator]:	EC [mS/cm]:	-NA-	-NA-	-NA-	80.0	
	Tolerance [$\mu\text{S}/\text{cm}$]:	± 0.000	± 0.00	± 0.01	-NA-	
	Tolerance [mS/cm]:	-NA-	-NA-	-NA-	± 0.8	
	Reading [$\mu\text{S}/\text{cm}$]:	0.000	0.00	0.05	-NA-	Passed
	Reading [mS/cm]:	-NA-	-NA-	-NA-	80.0	Passed

B) Test performed using supplied probes, according to specifications:

Temperature:	Ref. Temp. [$^{\circ}\text{C}$]:	0.0	25.0	50.0	
	Tolerance [$^{\circ}\text{C}$]:	± 0.2	± 0.2	± 0.2	
	Readings [$^{\circ}\text{C}$]:	0.0	25.1	50.2	Passed
EC @ 25 $^{\circ}\text{C}$:	Ref. EC [$\mu\text{S}/\text{cm}$]:	0.000	-NA-	-NA-	-NA-
<small>(meter calibrated in 3 points: 1413 $\mu\text{S}/\text{cm}$, 12.88 $\mu\text{S}/\text{cm}$, 111.8 $\mu\text{S}/\text{cm}$)</small>	Ref. EC [mS/cm]:	-NA-	1.413	12.88	111.8
	Tolerance [$\mu\text{S}/\text{cm}$], [mS/cm]:	$\pm 1\%$ of reading			
	Readings [$\mu\text{S}/\text{cm}$]:	0.000	-NA-	-NA-	-NA-
	Readings [mS/cm]:	-NA-	1.413	12.88	111.8

* All external references are periodically checked; NA = not applicable; NP = not performed; RES = Resistance value;

Calibration and testing criteria have been met.

Date: 2022.06.01

QC Inspector: Tudor Coman / Engineer

Signature: _____

(Name / Title / Signature)

IQC_HI98192_rev.0.1_July 2010

Electrode Quality Certificate

Electrode: HI763133 Parameter: EC/TDS/Temperature SN: 0922045N Recommended for: HI98192

Description: Four-ring conductivity probe with internal temperature sensor

Hanna Instruments certifies that this electrode has been produced, calibrated and tested to meet all applicable Hanna Instruments procedures, using standards and reference instruments, the accuracy of which is traceable to the National Institute of Standards (NIST) in the USA or to internationally acceptable national physical standards. The standards and reference instruments used in calibration and testing are supported by a calibration system which meets requirements of ISO 9001.

Standard Reference Materials: EC: SRM 999 [NIST]
External / Internal reference devices*: °C: NTO-031 [NIST Certified Thermometers Set]

Tests performed using reference devices:

EC (@ 25 °C):	Offset (air) [µS/cm]:	0.00	
	Tolerance [µS/cm]:	+ 0.01	
	Reading [µS/cm]:	0.00	Passed
	EC (standard) [mS/cm]:	12.88	
EC response time (Cal.: 12.88 mS/cm; Reading: 5.00 mS/cm)**:	Tolerance [mS/cm]:	10.30 - 15.46	
	Reading [mS/cm]:	12.46	Passed
	Standard time [s]:	< 5	Passed
	Tolerance [s]:	+ 1	
Temperature:	Ref. Temp. [°C]:	5.0 25.0	
	Tolerance [°C]:	± 0.5 ± 0.5	
	Readings [°C]:	5.1 25.2	Passed

*All references are periodically checked and are used only if are inside certification interval; NP = not performed.

**Evaluated for 90% of step.

Quality control and testing criteria have been met.

Date: 2022.05.31

QC Inspector:

Signature:

EQC_HI763133_rev.0.1_July 2018

Hanna Instruments Inc. 584 Park East Drive Woonsocket, RI 02895
www.hannainst.com

CERTIFICATE OF CALIBRATION

Certificate No.: T0-2309013/22

Page 1 **of total** 2 **pages**

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment Digital Thermo-Hygrometer
Manufacturer ThermoPro **Model** -
Serial No. A00064 **ID No.** -
Description Temperature range : 20 °C to 30 °C, Resolution of UUC : 0.1 °C
Humidity range : 30 %RH to 60 %RH, Resolution of UUC : 1 %RH

Environmental Conditions Ambient Temperature: (23 ± 3) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: -

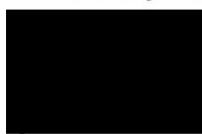
Calibration Location Blue Devils Laboratory (TL)

Received Date 23 September 2022

Calibration Date 26 September 2022

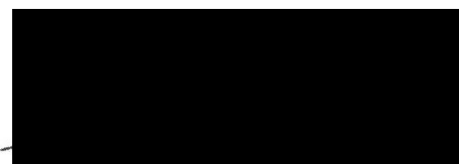
Date of Issue 26 September 2022

Checked by



Act as Technical Manager

Approved by



Representative of Managing Director

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Certificate No.: T0-2309013/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-089 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Chilled Mirror Hygrometer	Dewmaster	53787/2A5508X	TH-0013-22	Feb. 8, 2023	NIMT
Chilled Mirror Hygrometer with Temperature Sensor			TT-0012-22		
4.5 Cubic Foot Reach-In Chamber	7041-8110-4A	2101151	I0-0202001/22	Feb. 4, 2024	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

1) Temperature Measurement (X) Without Adjustment

Standard Temperature Reading (°C)	UUC Temperature Reading (°C)	Correction (°C)	Uncertainty (\pm °C)
20.00	20.1	-0.10	0.26
30.00	29.9	0.10	0.26

2) Humidity Measurement (X) Without Adjustment

Ambient Temperature Reading (°C)	Standard Humidity Reading (%RH)	UUC Humidity Reading (%RH)	Correction (%RH)	Uncertainty (\pm %RH)
25.0	30.0	31	-1.0	0.83
25.0	60.0	60	0.0	0.83

UUC: Unit Under Calibration

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by



CERTIFICATE OF CALIBRATION

Certificate No.: T0-2309011/22

Page 1 **of total** 2 **pages**

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment Liquid In-Glass Thermometer
Manufacturer - **Model** -
Serial No. 335020570 **ID No.** -
Description Temperature range : -10 °C to 110 °C, Resolution of UUC : 1 °C
Type of Immersion : Total Immersion

Environmental Conditions Ambient Temperature: (23 ± 3) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: -

Calibration Location Blue Devils Laboratory (TL)

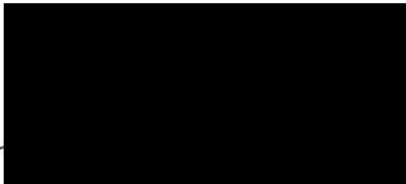
Received Date 23 September 2022

Calibration Date 26 September 2022

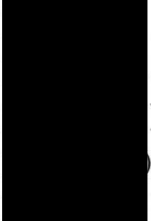
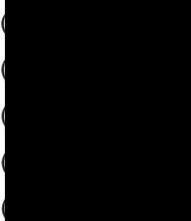
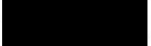
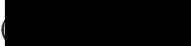
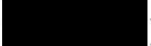
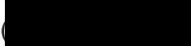
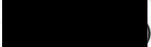
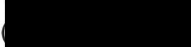
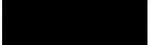
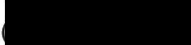
Date of Issue 26 September 2022

Checked by 

Act as Technical Manager

Approved by 

Representative of Managing Director

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(Dr. Ekachai Puttitwong)

Certificate No.: T0-2309011/22

Page 2 of total 2 pages
Reference Method:

- The calibration method used was CP-112 based on an ASTM E77-1998.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	1529-R	B7C853	I0-1011001/21	Nov. 10, 2022	THC
Platinum Resistance Thermometer	5626	4854	C0A30047	Oct. 22, 2023	
Liquid Bath	XORTS-40A	XO111019	I0-0306002/21	Jun. 3, 2023	

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
25.5	25	0.5	0.24
50.4	50	0.4	0.24

UUC : Unit Under Calibration

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by



CERTIFICATE OF CALIBRATION

Certificate No.: T0-2309012/22

Page 1 **of total** 2 **pages**

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment Digital Thermometer with Probe
Manufacturer Lutron **Model** PTM-816
Serial No. I.385436 **ID No.** -
Description Temperature range : 4 °C to 45 °C, Resolution of UUC : 0.1 °C

Environmental Conditions Ambient Temperature: (23 ± 3) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: -

Calibration Location Blue Devils Laboratory (TL)

Received Date 23 September 2022

Calibration Date 26 September 2022

Date of Issue 26 September 2022

Checked by _____

Approved by _____

Act as Technical Manager

Representative of Managing Director

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Certificate No.: T0-2309012/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-096 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	1529-R	B7C853	I0-1011001/21	Nov. 10, 2022	THC
Platinum Resistance Thermometer	5626	4854	C0A30047	Oct. 22, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	I0-0306002/21	Jun. 3, 2023	THC
Liquid Bath	7381	C07696	I0-0306004/21	Jun. 7, 2023	

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.
- FLUKE, Fluke Comporation, U.S.A.

Measurement Results: (X) Without Adjustment

Dimension of probe : Diameter 3 mm. Sensor Type : RTD (PT100)

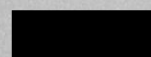
Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (\pm °C)
70	4.00	4.0	0.00	0.060
70	20.00	20.0	0.00	0.060
70	25.00	25.0	0.00	0.060
70	45.00	45.0	0.00	0.060

UUC : Unit Under Calibration

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by



CERTIFICATE OF CALIBRATION

Certificate No.: B0-2609027/22

Page 1 **of total** 2 **pages**

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment Standard Weight
Manufacturer Mettler Toledo **Model** -
Serial No. 15838 **ID No.** -
Description Size: 500 mg, Quantity: 1 Pcs.

Environmental Conditions Ambient Temperature: $(20 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 10) \%$
Atmospheric Pressure: $(1010 \pm 10) \text{ mbar}$

Calibration Location Gators Laboratory (BL)

Received Date 26 September 2022

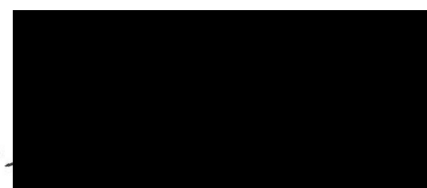
Calibration Date 27 September 2022

Date of Issue 27 September 2022

Condition of the artifacts Good Conditions

Checked by


Act as Technical Manager

Approved by


Representative of Managing Director

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Certificate No.: B0-2609027/22

Page 2 of total 2 pages
Reference Method:

- The calibration method used was CP-210 based on OIML R111-1:2004
- The conventional density of standard weight (E2) was estimated as $8,000 \pm 30 \text{ kg/m}^3$.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set 500 mg	-	158841	MM-0032-22	Mar. 15, 2024	NIMT

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).

Measurement Results:

Nominal Values	Conventional Mass		Uncertainty of Measurement	Maximum Permissible Error of Class F1 (MPE)
	Before Adjustment	After Adjustment		
500 mg	500 mg -0.010 mg		$\pm 0.027 \text{ mg}$	$\pm 0.080 \text{ mg}$

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by



CERTIFICATE OF CALIBRATION

Certificate No.: B0-2609028/22

Page 1 **of total** 2 **pages**

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	Standard Weight		
Manufacturer	Mettler Toledo	Model	-
Serial No.	15840	ID No.	-
Description	Size: 2 g, Quantity: 1 Pcs.		

Environmental Conditions

Ambient Temperature:	(20 ± 2) °C
Relative Humidity:	(50 ± 10) %
Atmospheric Pressure:	(1010 ± 10) mbar

Calibration Location Gators Laboratory (BL)

Received Date 26 September 2022

Calibration Date 27 September 2022

Date of Issue 27 September 2022


Condition of the artifacts Good Conditions

Checked by



Act as Technical Manager

Approved by



Representative of Managing Director

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Certificate No.: B0-2609028/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-210 based on OIML R111-1:2004
- The conventional density of standard weight (E2) was estimated as $8,000 \pm 30 \text{ kg/m}^3$.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set 2 g	-	158841	MM-0032-22	Mar. 15, 2024	NIMT

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).

Measurement Results:

Nominal Values	Conventional Mass		Uncertainty of Measurement	Maximum Permissible Error of Class F1 (MPE)
	Before Adjustment	After Adjustment		
2 g	2 g +0.010 mg		$\pm 0.040 \text{ mg}$	$\pm 0.12 \text{ mg}$

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by



CERTIFICATE OF CALIBRATION

Certificate No.: B0-2609029/22

Page 1 **of total** 2 **pages**

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	Standard Weight		
Manufacturer	Mettler Toledo	Model	-
Serial No.	-	ID No.	TEAM/LA301
Description	Size: 200 g, Quantity: 1 Pcs.		

Environmental Conditions

Ambient Temperature:	(20 ± 2) °C
Relative Humidity:	(50 ± 10) %
Atmospheric Pressure:	(1010 ± 10) mbar

Calibration Location Gators Laboratory (BL)

Received Date 26 September 2022

Calibration Date 27 September 2022

Date of Issue 27 September 2022

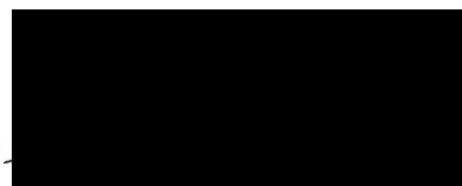
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Certificate No.: B0-2609029/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-210 based on OIML R111-1:2004
- The conventional density of standard weight (E2) was estimated as $8,000 \pm 30 \text{ kg/m}^3$.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set 200 g	-	158841	MM-0032-22	Mar. 15, 2024	NIMT

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).

Measurement Results:

Nominal Values	Conventional Mass		Uncertainty of Measurement	Maximum Permissible Error of Class M2 (MPE)
	Before Adjustment	After Adjustment		
200 g	200 g +6.62 mg	-	$\pm 10 \text{ mg}$	$\pm 30 \text{ mg}$

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

CERTIFICATE OF CALIBRATION

Certificate No.: B0-2609030/22

Page 1 **of total** 2 **pages**

Customer GEOTECHNICAL & FOUNDATION ENGINEERING CO., LTD.
151 Nuan Chan Road, Nuan Chan, Bueng Kum, Bangkok 10230

Equipment	Standard Weight		
Manufacturer	Mettler Toledo	Model	-
Serial No.	216504	ID No.	-
Description	Size: 100 g, Quantity: 1 Pcs.		

Environmental Conditions

Ambient Temperature:	(20 ± 2) °C
Relative Humidity:	(50 ± 10) %
Atmospheric Pressure:	(1010 ± 10) mbar

Calibration Location Gators Laboratory (BL)

Received Date 26 September 2022

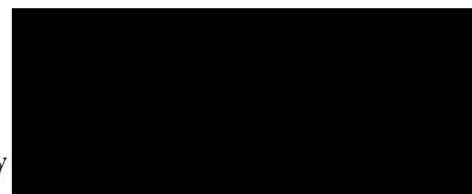
Calibration Date 27 September 2022

Date of Issue 27 September 2022

Condition of the artifacts Good Conditions

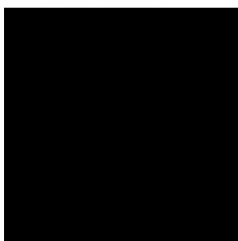
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Act as Technical Manager

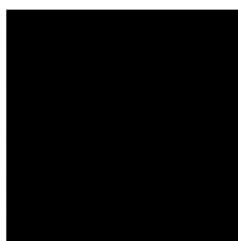
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(Dr. Ekachai Puttitwong)

Certificate No.: B0-2609030/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-210 based on OIML R111-1:2004
- The conventional density of standard weight (E2) was estimated as $8,000 \pm 30 \text{ kg/m}^3$.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set 100 g	-	158841	MM-0032-22	Mar. 15, 2024	NIMT

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).

Measurement Results:

Nominal Values	Conventional Mass		Uncertainty of Measurement	Maximum Permissible Error of Class F1 (MPE)
	Before Adjustment	After Adjustment		
100 g	100 g +0.03 mg		$\pm 0.17 \text{ mg}$	$\pm 0.50 \text{ mg}$

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป
(ประเทศไทย) จำกัด



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES



Cert. No.: 23TM637

Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 45

Serial No. : L712.0429

ID No. : BKK_ML0056

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Incubator & Microbiological Reading

Received Order : 20 April 2023

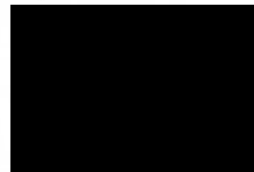
Calibration Date : 20 April 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

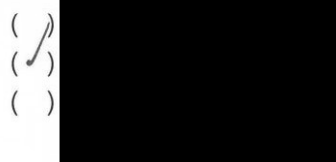
REVIEW BY	
APPROVED BY	
NEXT CAL. DATE	20/4/24

Calibrated by :



Approved by :

Approved Signatory



Issue Date :

24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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

A 0053357



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2304-0253OC-1

Cert. No.: 23TM637

Page : 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

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

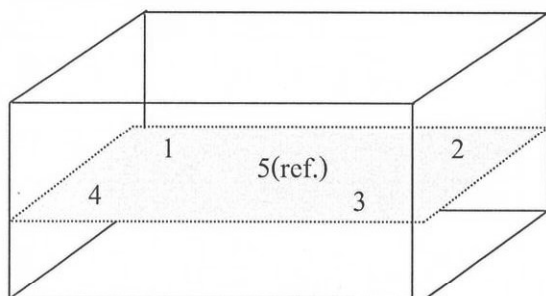
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	<u>Environmental</u>		<u>AC Voltage Supply</u>
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	45	223
Finished of Calibration	25	43	223



Front

<u>Position :</u>	<u>Ref. Std. S/N.:</u>
1	4803988-006
2	4803988-007
3	4804539-014
4	4804539-015
5(ref.)	4804539-016





Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2304-0253OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM637

Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty
			Position					
			1	2	3	4	5 (ref.)	(± °C)
44.5	44.5	44.5	44.492	44.463	44.475	44.510	44.491	0.15
45.0	45.0	45.0	45.005	44.962	44.979	45.016	44.986	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor <i>k</i>
44.5	0.051	0.022	2
45.0	0.080	0.026	2

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

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

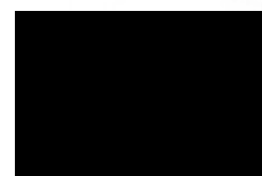
Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

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

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)



Cert. No.: 22TM1572

Page : 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : INE 800

Serial No. : E805.0063

ID No. : BKK_ML0018

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Incubation & Microbiological Reading

Received Order : 21 November 2022

Calibration Date : 21 November 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by :

Approved by :

()
(✓)
()

REVIEW BY ,...

APPROVED BY

NEXT CAL. DATE 21/11/23

Approved Signatory

Issue Date :

29 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048159



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2211-0623OC-10

Cert. No.: 22TM1572

Page : 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	22LM121	22 Aug 2023

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

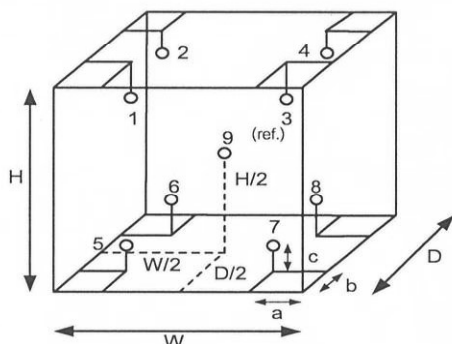
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) After Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	51	50
AC Supply (Volt)	220	220



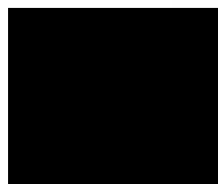
Position :	Ref. Std. ID No.:
1	15RTD2/11
2	15RTD2/12
3	15RTD2/13
4	15RTD2/14
5	15RTD2/15
6	15RTD2/16
7	15RTD2/17
8	15RTD2/18
9 (ref.)	15RTD2/19

Probe Installation Details :

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

Dimension of Chamber :

D = 0.60 m
 W = 1.0 m
 H = 1.2 m
 Capacity = 0.75 m³





Equipment : Incubator
Condition As-Received : Used Item
Reference : 2211-0623OC-10
Result of Calibration :- (*) After Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM1572

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
35.0	35.0	35.0	0.064	0.69	0.78	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	35.295	35.328	35.303	35.383	34.683	35.389	34.709	35.215	34.759

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.

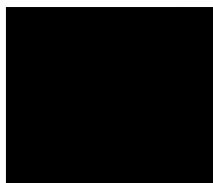
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

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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Certificate No. T230902

Page 1 of 5

Certificate of Calibration

Equipment : Digestion Unit

Manufacturer : SCP Science

Model : DigiPRER HT

Serial No. : HTC1120480658

Customer Code : BKK_EN0366

ID No. : T2635A5

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250

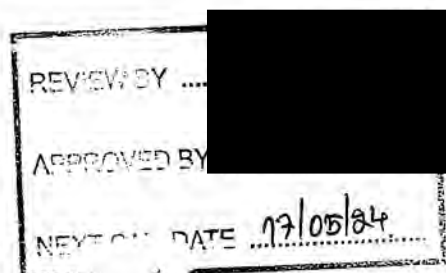
Customer Location : Wet Chemistry Lab 1

Date of Receipt : 10 May 2023

Calibrated By : (Site Calibration Manager)

Approved By : (Site Calibration Manager)

Date of Issue : 29 MAY 2023



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

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

Certificate No. T230902

Page 2 of 5

Calibration Report

Equipment : Digestion Unit
Date of Calibration : 17 May 2023
Environment : Temperature : 23.9 - 26.3 °C
Line Voltage : 221.8 - 225.9 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert four standard thermocouples type S into its chamber , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T10.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	Type S	M20A1-(CH17-CH20)	T230547	18 April 2024
DATA LOGGER	34970A	T149	T230547	18 April 2024

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

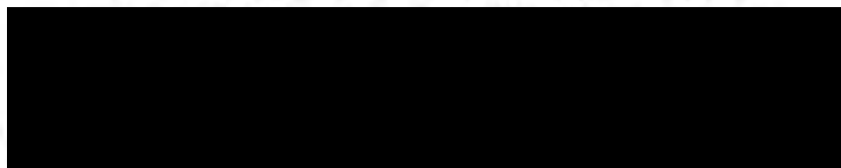
Time Constant 1 Hour 54 Minute At 380 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment

() after adjustment

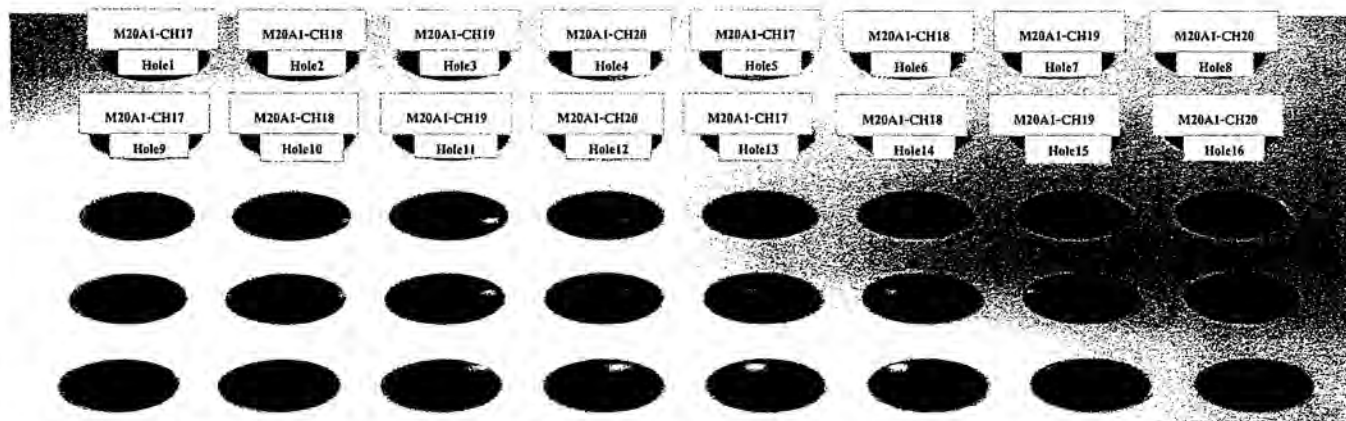
Approved By. _____



Certificate No. T230902

Page 3 of 5

Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	Hole1	Hole2	Hole3	Hole4	Hole5	Hole6	Hole7	Hole8
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max °C	377.3	379.0	379.2	380.2	377.5	379.5	380.7	380.1
			Min °C	376.8	378.6	378.9	379.9	377.0	379.0	380.2	379.6
			Average °C	377.0	378.8	379.1	380.0	377.3	379.2	380.4	379.9
			Stability ± °C	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	Hole9	Hole10	Hole11	Hole12	Hole13	Hole14	Hole15	Hole16
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max °C	377.1	378.9	379.7	379.9	379.3	379.6	379.5	377.4
			Min °C	376.7	378.5	379.3	379.5	378.9	379.1	379.0	377.0
			Average °C	376.9	378.7	379.5	379.7	379.1	379.4	379.3	377.2
			Stability ± °C	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2

Approved By.





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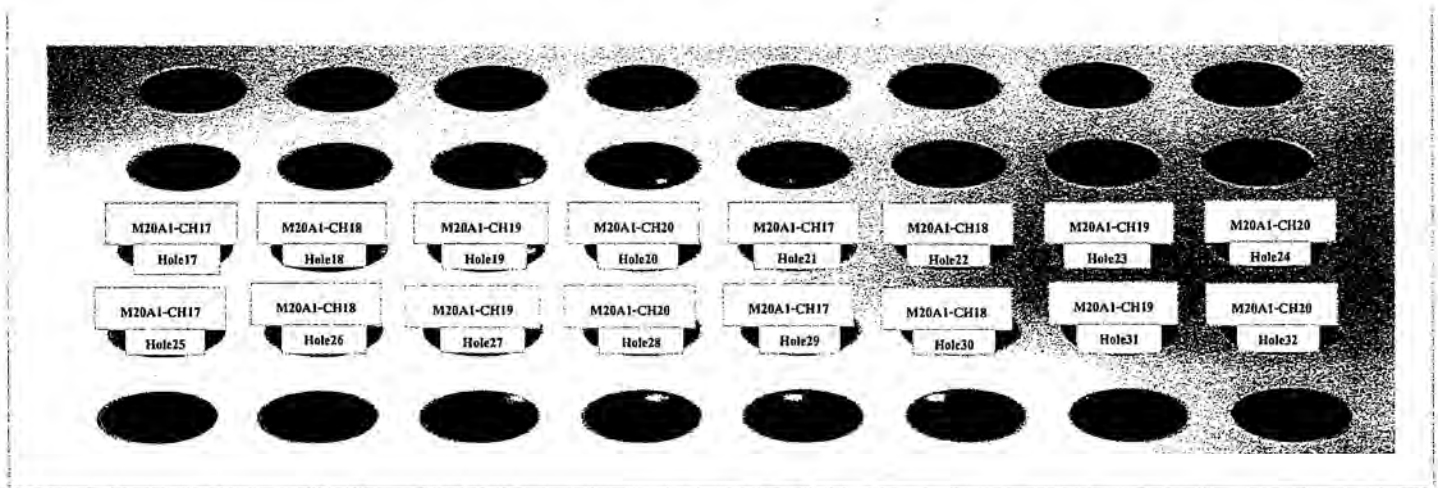
SCI ECO Services Company Limited



Certificate No. T230902

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Calibration Report



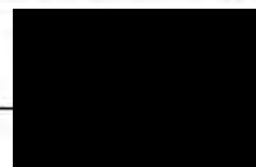
FRONT

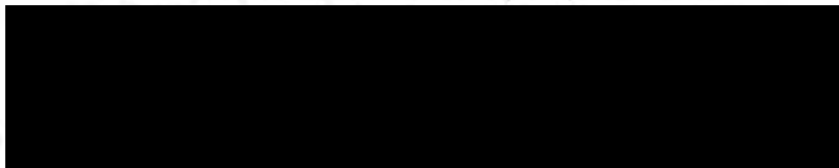
Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
($^{\circ}\text{C}$)	($^{\circ}\text{C}$)	($^{\circ}\text{C}$)	Reading	Hole17	Hole18	Hole19	Hole20	Hole21	Hole22	Hole23	Hole24
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max $^{\circ}\text{C}$	378.4	380.1	380.1	380.0	379.1	379.8	379.6	377.8
			Min $^{\circ}\text{C}$	377.8	379.6	379.7	379.3	378.6	379.2	379.2	377.3
			Average $^{\circ}\text{C}$	378.1	379.9	379.9	379.7	378.9	379.5	379.4	377.5
			Stability \pm $^{\circ}\text{C}$	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
($^{\circ}\text{C}$)	($^{\circ}\text{C}$)	($^{\circ}\text{C}$)	Reading	Hole25	Hole26	Hole27	Hole28	Hole29	Hole30	Hole31	Hole32
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max $^{\circ}\text{C}$	377.9	379.4	380.1	380.1	379.3	379.6	378.9	377.3
			Min $^{\circ}\text{C}$	377.4	378.9	379.7	379.7	378.8	378.9	378.4	376.7
			Average $^{\circ}\text{C}$	377.7	379.2	379.9	379.9	379.0	379.3	378.6	377.0
			Stability \pm $^{\circ}\text{C}$	0.3	0.3	0.2	0.2	0.3	0.4	0.3	0.3

Approved By.

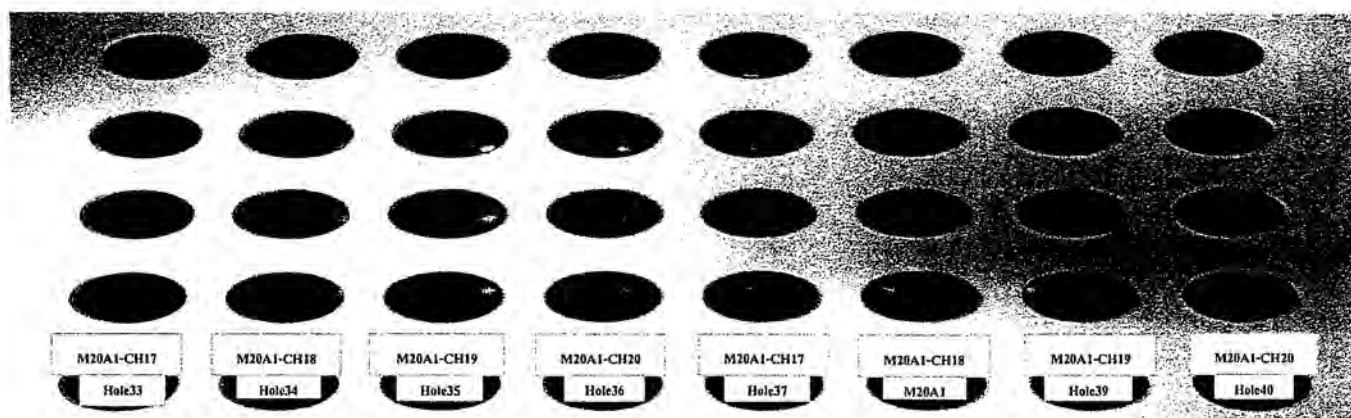




Certificate No. T230902

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Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	Hole33	Hole34	Hole35	Hole36	Hole37	Hole38	Hole39	Hole40
				M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20	M20A1-CH17	M20A1-CH18	M20A1-CH19	M20A1-CH20
380.0	380.0	379.4 - 380.7	Max °C	377.7	378.0	378.3	379.0	378.2	378.5	377.3	377.4
			Min °C	377.3	377.6	377.9	378.6	377.7	378.1	376.9	377.0
			Average °C	377.5	377.8	378.1	378.8	378.0	378.3	377.1	377.2
			Stability ± °C	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

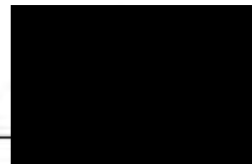
 The expanded uncertainty of temperature measurement was $\pm 1.85^{\circ}\text{C}$

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

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

Approved By.



Certificate No. T230760

Page 1 of 5

Certificate of Calibration

Equipment : HOT BLOCK

Manufacturer : Environmental Express

Model : B3000- 240

Serial No. : 2017CODW116

Customer Code : BKK_EN0222

ID No. : T6769A4

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250

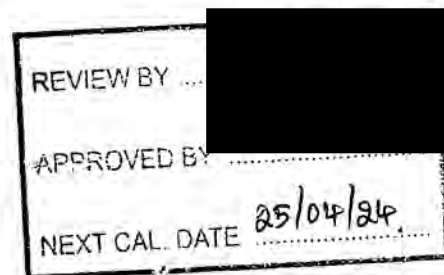
Customer Location : Wet Chemistry Lab2

Date of Receipt : 21 April 2023

Calibrated By : [REDACTED] (Technician)

Approved By : [REDACTED] (Site Calibration Manager)

Date of Issue : 12 MAY 2023



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

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

Certificate No. T230760

Page 2 of 5

Calibration Report

Equipment : HOT BLOCK
Date of Calibration : 25 April 2023
Environment : Temperature : 22.9-24.4 °C
Line Voltage : 222.7-227.8 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 20 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN121-TN130	T222122	5 October 2023
TC	TYPE T	TN131-TN140	T222122	5 October 2023
DATA LOGGER	34970A	T150	T222122	5 October 2023

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour 32 Minute At 150 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment

() after adjustment

Approved By _____



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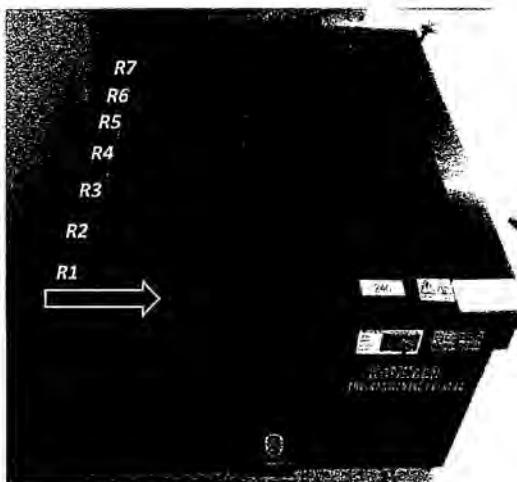
Metrological Center

SCI ECO Services Company Limited

Certificate No. T230760

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Calibration Report



Row	Hole							
R7	H49	H50	H51	H52	H53	H54	H55	H56
R6	H41	H42	H43	H44	H45	H46	H47	H48
R5	H33	H34	H35	H36	H37	H38	H39	H40
R4	H25	H26	H27	H28	H29	H30	H31	H32
R3	H17	H18	H19	H20	H21	H22	H23	H24
R2	H9	H10	H11	H12	H13	H14	H15	H16
R1	H1	H2	H3	H4	H5	H6	H7	H8

H: STANDARD THERMOCOUPLE TYPE T

H1	=	TN121	H9	=	TN129	H17	=	TN137	H25	=	TN125	H33	=	TN133	H41	=	TN121	H49	=	TN129
H2	=	TN122	H10	=	TN130	H18	=	TN138	H26	=	TN126	H34	=	TN134	H42	=	TN122	H50	=	TN130
H3	=	TN123	H11	=	TN131	H19	=	TN139	H27	=	TN127	H35	=	TN135	H43	=	TN123	H51	=	TN131
H4	=	TN124	H12	=	TN132	H20	=	TN140	H28	=	TN128	H36	=	TN136	H44	=	TN124	H52	=	TN132
H5	=	TN125	H13	=	TN133	H21	=	TN121	H29	=	TN129	H37	=	TN137	H45	=	TN125	H53	=	TN133
H6	=	TN126	H14	=	TN134	H22	=	TN122	H30	=	TN130	H38	=	TN138	H46	=	TN126	H54	=	TN134
H7	=	TN127	H15	=	TN135	H23	=	TN123	H31	=	TN131	H39	=	TN139	H47	=	TN127	H55	=	TN135
H8	=	TN128	H16	=	TN136	H24	=	TN124	H32	=	TN132	H40	=	TN140	H48	=	TN128	H56	=	TN136

Approved By. _____



Certificate No. T230760

Page 4 of 5

Calibration Report

Measurement Results

			Average Standard Reading at each position (° C)									
Calibration Point			TN121	TN122	TN123	TN124	TN125	TN126	TN127	TN128	TN129	TN130
Point	Setting	Max	149.31	149.49	149.73	148.49	149.26	149.81	149.42	148.86	148.78	149.19
150	150.0	Min	149.14	149.31	149.54	148.36	149.08	149.65	149.22	148.65	149.07	149.07
		Average	149.23	149.40	149.64	148.43	149.16	149.73	149.33	148.76	148.71	149.13
			TN131	TN132	TN133	TN134	TN135	TN136	TN137	TN138	TN139	TN140
		Max	149.90	150.18	150.18	149.16	148.89	149.72	149.28	149.50	150.01	149.32
		Min	149.78	150.06	149.69	149.03	148.76	149.49	149.12	149.37	149.90	149.23
		Average	149.84	150.12	149.76	149.09	148.81	149.62	149.19	149.43	149.95	149.27
			TN121	TN122	TN123	TN124	TN125	TN136	TN127	TN128	TN129	TN130
		Max	149.88	149.14	149.20	150.02	148.75	149.57	149.21	149.18	150.13	148.91
		Min	149.67	148.94	148.98	149.83	148.58	149.43	149.06	149.01	149.91	148.72
		Average	149.78	149.05	149.11	149.94	148.67	149.51	149.13	149.10	150.03	148.83
			TN131	TN132	TN133	TN134	TN135	TN136	TN137	TN138	TN139	TN140
		Max	149.42	149.52	149.13	148.94	148.84	150.16	149.42	149.54	149.66	150.08
		Min	149.27	149.36	148.99	148.81	148.70	149.99	149.27	149.39	149.52	149.97
		Average	149.36	149.45	149.06	148.88	148.76	150.08	149.36	149.48	149.60	150.03
			TN121	TN122	TN123	TN124	TN125	TN126	TN127	TN128	TN129	TN130
		Max	149.21	149.16	149.50	148.68	148.58	149.81	149.06	150.40	148.46	149.24
		Min	149.03	148.93	149.27	148.48	148.42	149.62	148.78	150.26	148.14	149.04
		Average	149.12	149.04	149.39	148.57	148.51	149.72	148.93	150.33	148.29	149.14
			TN131	TN132	TN133	TN134	TN135	TN136				
		Max	148.79	148.23	149.03	149.09	148.46	149.25				
		Min	148.49	147.98	148.88	148.94	148.29	149.12				
		Average	148.61	148.06	148.94	149.02	148.35	149.19				

Approved By. _____



Certificate No. T230760

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Calibration Report

Measurement Results

HOT BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (\pm °C)	Uncertainty (\pm °C)
	Min , Max	Average		
150.0	150 , 150.1	150.0	0.20	0.82

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

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

Approved By. _____





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES



Cert.No.: 22CG3154

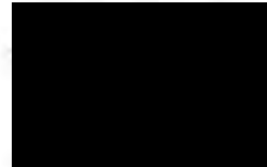
Page.: 1 of 2

Certificate of Calibration

Equipment :	Burette
Capacity :	50 mL
Serial No. :	-
ID. No. :	BKK_EN0171
Manufacturer :	Witeg
Made in :	Germany
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd. Khwaeng Phatthanakan, Khet Suan Luang Bangkok 10250 Thailand
Ambient Temperature :	(20 ± 2.5) °C
Relative Humidity :	(50 ± 10) %
Barometric Pressure :	759 mmHg
Calibration Procedure :	ASTM E 542 - 01

REVIEW BY	
APPROVED BY	
NEXT CAL. DATE	29/03/2024 CW

Calibrated by :



Approved by :

Approved Signatory

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()
(✓)
()

Issue Date :

31 August 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0044607



Equipment : Burette
Received Date : 26 August 2022
Condition As-Received : Used Item
Calibration Date : 30 August 2022
Reference : 2208-0918DSC-2

Cert.No.: 22CG3154

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID. No.</u>	<u>Certificate No.</u>	<u>Traceability</u>	<u>Due date</u>
1) Balance	AE200S	N03679	140RC001	21MM429	NIMT	22 Sep 2022
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	22H1243	NIST,NIMT	09 June 2023
3) Thermometer	-	1594592	140EC010	22I181	NIMT	10 Feb 2023

This certification is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.
3. True value is converted to true volume at the standard temperature of 20 °C

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (\pm mL)	k Factor
50	49.9959	0.010	2.00

Remark mL = cm³

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

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a 1123908



บริษัท ดับเบิล เอส ไดแอกโนสติกส์ จำกัด
DOUBLE S DIAGNOSTICS CO., LTD.

Maintenance Plan YEAR : 2022

เดือน	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
รวม						ph CK						

Periodical maintenance check list for Konelab

	6M	12M	Note!
1.Diluent-wash tubing change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.ISE tubing change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3.Syringe check/change		<input checked="" type="checkbox"/>	
4.Dispensing check/ change		<input checked="" type="checkbox"/>	
5.Waste tubing change when necessary		<input checked="" type="checkbox"/>	
6.Lamp check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
7.Mixer paddle/paddle change(not Konelab20)		<input checked="" type="checkbox"/>	
8.ISE needles check/change		<input checked="" type="checkbox"/>	
9.Pump tubing check/ chance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
10.Broken/worn out part check /change		<input checked="" type="checkbox"/>	
11.Peristaltic pump check /cleaning/ lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12.Heating check		<input checked="" type="checkbox"/>	
13.Cooling check		<input checked="" type="checkbox"/>	
14.Dispenser mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
15.Cuvette transfer mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
16.Dispenser movement check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
17.Sample/reagent register check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
18.Dispensing tubing tightness check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
19.Photometer and optics cleaning/check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
20.Workstation PC cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
21.Mechanic cleaning/lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
22.Instrument cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
23.Complete analyzer testing with waterblank/QC or sample	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
24.Test parameters/Adjustment/config. Save to USB key	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
25.UPS Test	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Place: ALS LAB Instrument: K20 Agc/ken 290

Date/Time: 30-6-65 Serial no: 22781

Service done by: Install date:

Signature of customer: Date/Time: 30/6/22



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES



Cert.No.: 22TW122

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-230V
Serial No. : 09J101147
ID No. : BKK_EN0017
Received Date : 20 May 2022
Test Date : 24 May 2022
Reference : 2205-0638DSC-8
Submitted by :

ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Warakorn Lerngatrakul

Approved by :

Approved Signatory

(✓)
()
()

Issue Date : 31 May 2022

REVIEW BY ..	
APPROVED BY	
NEXT CAL. DATE	24/5/23



Cert.No.: 22TW122

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	21MM430	21 Sep 2022

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : **Dissolved Oxygen Meter Adjustment With Air 100 %**

Dissolved Oxygen Probe No.: 16K100498

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.12	8.13	0.015

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory.

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a 1110482



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.: 22LM83

Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor

Manufacturer : YSI

Model : 5000-230V

Serial No. : 09J 101147

ID No. : BKK_EN0017

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : TPA On Site Calibration Laboratory

Received Order : 20 May 2022

Calibrated Date : 30 May 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Tawatchai Pama


Approved by : 
Approved Signatory

() 

Issue Date : 31 May 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0039957



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2205-0638DSC-10
Procedure Used :-

Cert. No.: 22LM83

Page.: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1502A	A09204	2218	04 Jan 2023

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

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with thermistor sensor , ID No.: 16K100498

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
20.00	60	20.003	20.01	0.007	0.15	2.00

UUC* : Unit Under Calibration

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

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NSC-TISI-TIS 17025
CALIBRATION 0426

SARTORIUS

Certificate

of Calibration

REVIEW BY

APPROVED BY

NEXT CAL. DATE

8/2/24

Model Number : MSE224S-100-DU

Description : Analytical Balance

Serial Number : 26207042

ID No. : BKK_EN0002

Manufacturer : Sartorius

Certificate No. : 23BCI0072

Issued Date : Monday, February 13, 2023

Reference No. : 203245

Page No. : 1 of 2

Customer Name : ALS Laboratory Group (Thailand)Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250.

Calibrated Place : Balance Room

Calibrated By :

Calibration Date : Wednesday, February 08, 2023

Calibration

Procedure No. : This calibration was conducted by
Using in-house calibration procedure number (WI-003)

Based on UKAS LAB 14 : 2019

Metrological data :

Capacity : 220 g Readability : 0.0001 g

Ambients Conditions:

Temperature : 23.2 °C ± 5.0 °C

Humidity : 60.0 % RH ± 10.0 % RH

Pressure : ±

Reasons for calibration

☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ MaintenanceEquipment Condition: ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref : Lab 14

The measurement uncertainty stated is the expended 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). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2, YCS011-522-00	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp Lutron MHB-382SD	DKSH	C19220444	5-Sep-2023

This certificate relate and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division
Sartorius (Thailand) Co., Ltd.



Certificate of Calibration

Model Number : MSE224S-100-DU

Certificate No. : 23BCI0072

Description : Analytical Balance

Issued Date : Monday, February 13, 2023

Serial Number : 26207042

Reference No. : 203245

ID No. : BKK_EN0002

Manufacturer : Sartorius

Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability

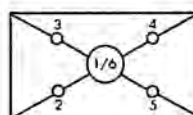
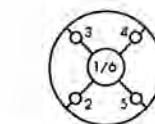
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	20.0000	200.0000
20 g	20.0000	199.9999
Tolerance	20.0000	200.0000
0.0001 g	20.0000	199.9999
	20.0001	200.0000
Nominal Value : (High Load)	20.0000	200.0000
200 g	20.0000	199.9999
Tolerance	20.0000	199.9999
0.0001 g	20.0000	200.0000
	20.0001	199.9999
Standard Deviation	0.00004	0.00005

Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).

Nominal value : 50 g
Tolerance 0.0004 g



	Difference
1	—
2	-0.0001
3	0.0000
4	0.0001
5	0.0000
6	—

Linearity

The linearity, also called linearity error, Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00014
0.1	0.1000	0.1000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
2	2.0000	2.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00014
50	50.0000	50.0000	0.0000	0.00015
100	100.0000	100.0000	0.0000	0.00019
200	200.0000	199.9999	-0.0001	0.00030

End of Report.