

CERT.No.: HS-U049G

Calibration Date : 2 Aug 23
 Submitted by : SAINT ENVIR CO.,LTD
 30/29-30 Soi. Seri Thai 68, Seri Thai Rd.,
 Minburi, Bangkok 10510

Avg Room Temp : 20 °C
 Avg Water Temp : 20 °C
 Air Pressure : 760.00 mmHg
 Salinity : 0 ppt

Model : YSI 5000
 S/N : 08J100943
 Probe : YSI 5010
 S/N : 22G100123
 ID NO. :
 Air Temp ref : S/N. E00522
 Barometric ref : S/N. E00522
 Water Temp ref : S/N. 11430
 Technician : Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.09	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.09	(PASS)	-
Measurement 4 (mg/l)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.08	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.07	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.07	(PASS)	-
Measurement 10 (mg/l)	9.07	(PASS)	-

Mean Measurement	9.08	mg/l	-	-
Inaccuracy	0.01	mg/l	-	-

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.



Technician Signature
 (Kittipong Maekwong)



Laboratory Manager
 (Supreecha Sumaritam)

Certificate No.: MC 2307593

Page 2 of 3

The Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit With Thermocouple Type " T " ID. No.28/1 to 28/9	MC 2301270	MY44020009	9 Mar 2024	MCAL

Traceability :

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eigh corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

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. The reference sensor should preferably be located at the geometric center of the chamber.

Temperature Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

Overall Variation - The Difference of the maximum and minnum measured temperatures throughout observation.

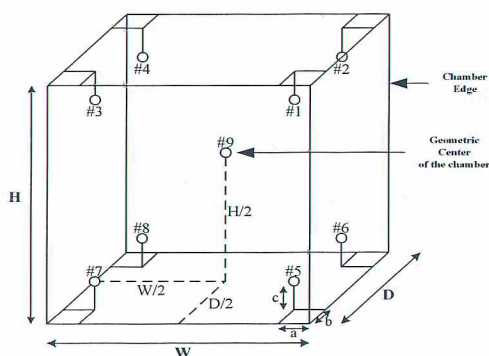


Figure 1 : Sensor Installation Location

Overall Ambient Temperature around the Chamber variation : 2.6 °C

Overall Line Voltage variation : 0.1 V

Chamber Size (W*H*D) : 110 cm x 140 cm x 60 cm

Checked by : *Thanagorn*

Certificate No.: MC 2307593

Page 3 of 3

2. Result of calibration :

This Chamber Reading From : Digital Thermometer, Manufacturer : SHIMAX, Model : MAC3D

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
20.0	21.8	22.0	20.4	20.4	19.6	19.6	19.6	19.7	19.6	0.53

Chamber Characterization Result

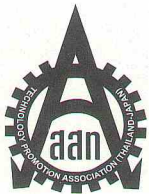
Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.0	0.25	2.60	2.8

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

This certificate will certify of the calibrated equipment only.

End of Certificate

 Checked by : *Thanagorn*



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH601

Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenMulti
Serial No. : 1228145259
ID No. : LEQ 020
Condition As-Received: Used Item
Received Date : 10 May 2023
Calibration Date : 11 May 2023
Reference : 2305-0321WN-1
Submitted by : Saint Envir Co.,Ltd.
30/29-30 Soi Sareethai 68, Sareethai Rd.,
Minburi Bangkok 10510
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lerngagtrakul

Approved by :

Malee

Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date : 16 May 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 0054248



Cert.No.: 23CH601

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

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

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

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: 1228145259	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Malu.

a 1161533



Cert.No.: 23CH601

Page.: 3 of 3

Calibration Results**Function : pH Measurement**

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor <i>k</i>
pH Electrode S/N.: 1130847	4.008	4.007	177.2	0.0046	2.00
	6.987	6.995	3.4	0.0084	2.00
	10.010	10.004	-171.5	0.0065	2.00

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

This equipment was connected with Temperature Probe;

- Model : InLab®Expert Pro

- Serial No. : 1130847

Dimension of probe;

- Length : 120 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor <i>k</i>
23.0	23.003	23.1	0.097	0.13	2.00
25.0	25.004	25.1	0.096	0.13	2.00
27.0	27.002	27.1	0.098	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

-o0o-

Malu.

a 1161532

Certificate of Calibration

TEMPERATURE CONTROLLER ENCLOSURES



Certificate No.: MC 2307594

Page 1 of 3



Customer : Saint Envir Co., Ltd.
30/29-30 Soi Sareethai 68, Sareethai Rd., Minburi, Minburi, BKK 10510.

Reference Job No. : 23-1551 Received Date : 6 July 2023

Description : Refrigerator

Manufacturer : Sanhui Model : SD2DC70

Serial No. : 1186 ID. No. : LEQ 024

Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2307594) has been attached to the case.

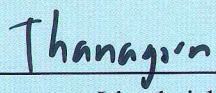
Method : In-House calibration procedure MWI-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".

Location of Calibration : Saint Envir Co., Ltd. ; Laboratory.

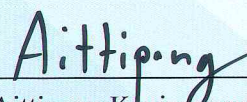
Environmental Conditions : Ambient Temperature : (30.1 to 34.0) °C
Relative Humidity : (36.0 to 56.0) %

Date of Calibration : 6 July 2023 Date of Issue : 10 July 2023

Checked by :


Thanagorn Limchaicharoen
(Calibration Supervisor)

Approved by :


Aittipong Kanjanawasit
(Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co.,Ltd.

Certificate No.: MC 2307594

Page 2 of 3

The Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit With Thermocouple Type " T " ID. No.26/1 to 26/9	MC 2301270	MY44020009	9 Mar 2024	MCAL

Traceability :

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eigh corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

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. The reference sensor should preferably be located at the geometric center of the chamber.

Temperature Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

Overall Variation - The Difference of the maximum and minnum measured temperatures throughout observation.

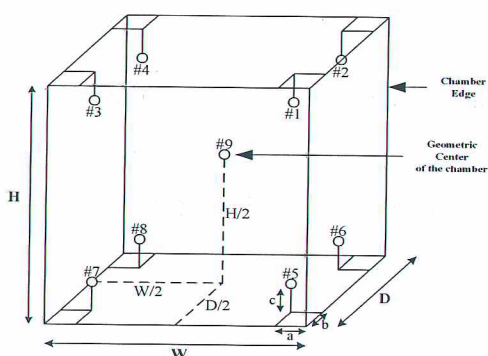


Figure 1 : Sensor Installation Location

Overall Ambient Temperature around the Chamber variation : 4.4 °C

Overall Line Voltage variation : 0.1 V

Chamber Size (W*H*D) : 105 cm x 140 cm x 60 cm

Checked by : *Thanagorn*

Certificate No.: MC 2307594

Page 3 of 3

2. Result of calibration :

This Chamber Reading From : Digital Thermometer, Manufacturer : SHIMAX, Model : MAC5A

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
4.0	3.5	3.2	4.6	3.8	5.0	4.9	3.5	4.0	4.0	0.47

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
4.0	4.0	0.34	1.24	2.3

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

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by : *Thanagorn*

Certificate of Calibration

TEMPERATURE CONTROLLER ENCLOSURES



NSC-TISI-TIS 17025
CALIBRATION 0183

Certificate No.: MC 2307598

Page 1 of 3



Customer : Saint Envir Co., Ltd.
30/29-30 Soi Sareethai 68, Sareethai Rd., Minburi, Minburi, BKK 10510.

Reference Job No. : 23-1551 Received Date : 6 July 2023

Description : Oven

Manufacturer : Memmert Model : UF 110

Serial No. : B417.1773 ID. No. : LEQ 064

Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2307598) has been attached to the case.

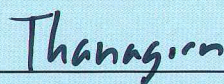
Method : In-House calibration procedure MWI-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".

Location of Calibration : Saint Envir Co., Ltd. ; Laboratory.

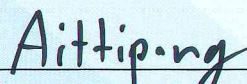
Environmental Conditions : Ambient Temperature : (30.1 to 34.3) °C
Relative Humidity : (37.0 to 56.0) %

Date of Calibration : 6 July 2023 Date of Issue : 10 July 2023

Checked by :


Thanagorn Limchaicharoen
(Calibration Supervisor)

Approved by :


Aittipong Kanjanawasit
(Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co.,Ltd.

Certificate No.: MC 2307598

Page 2 of 3

The Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit With Thermocouple Type " T " ID. No.25/1 to 25/4 and 25/6 to 25/10	MC 2301270	MY44020009	9 Mar 2024	MCAL

Traceability :

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eigh corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

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. The reference sensor should preferably be located at the geometric center of the chamber.

Temperature Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

Overall Variation - The Difference of the maximum and minnum measured temperatures throughout observation.

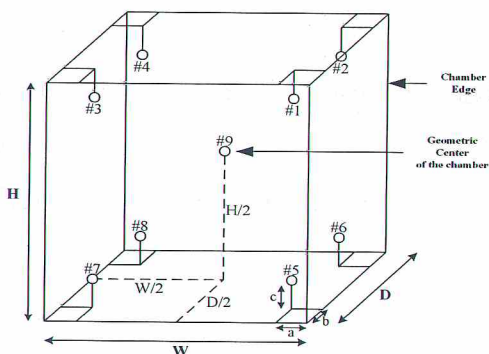


Figure 1 : Sensor Installation Location

Overall Ambient Temperature around the Chamber variation : 1.8 °C

Overall Line Voltage variation : 0.1 V

Chamber Size (W*H*D) : 56 cm x 48 cm x 40 cm

Checked by : *Thanayon*

Certificate No.: MC 2307598

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
104.0	103.9	103.7	104.1	103.5	104.2	103.8	104.3	103.8	104.1	0.45

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	0.18	0.73	1.0

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

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by : *Thanagorn*

Certificate of Calibration

SINGLE-PAN ELECTRONIC BALANCE



Certificate No.: MC 2300848

Page 1 of 3



Customer : Saint Envir Co., Ltd.

30/29-30 Soi Sareethai 68, Sareethai Rd., Minburi, Minburi, BKK 10510.

Reference Job No.	: 23-0178	Received Date	: 20 January 2023
Description	: Electronic Balance	Type	: Top-loading
Manufacturer	: Mettler Toledo	Model	: AB204-S
Capacity	: 220 g	Resolution	: 0.0001 g
Serial No.	: 1128261643	ID. No.	: LEQ 019
Marking	: Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2300848) has been attached to the case.		
Method	: In-house calibration procedure MWI-F-001 this method is reference to UKAS Publication ref: LAB 14 : 2015 "Calibration of weighing machines".		
Location of Calibration	: Saint Envir Co., Ltd.; St-Control Room.		
Environmental Conditions	: Ambient Temperature : (26.6 to 26.9) °C Relative Humidity : (65.6 to 69.9) % Air pressure : 1011 mbar		
Date of Calibration	: 23 January 2023	Date of Issue	: 26 January 2023

Checked by :

Pakorn H.

Pakorn Huadsoonthon

(Calibration Engineer)

Approved by :

Aittipong

Aittipong Kanjanawasit

(Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co.,Ltd.

Certificate No.: MC 2300848

Page 2 of 3

Page 2 of 3

The Reference Standard :

Description	Certificate No.	Serial No.	Due date
Standard weight set	C02221240	158801	27 June 2024
Standard weight set	C02221241	124947/00	27 June 2024

This certificate is traceable to the international system of units maintained at :

SPC RT Co., Ltd.

Result of calibration:
1. General Condition

As agreed with customer, the calibration range of the balance as shown in these results was carried out.

Pre-adjustment check : The correction to the balance reading before adjustment at load 200 g
 was found to be -0.0009 g

Adjustment : Yes (sensitivity adjustment)

2. Repeatability of Reading

Nominal Value g	Standard Deviation of reading g	Maximum difference between successive readings g
100	0.00000	0.0000
200	0.00000	0.0000

3. Departure from Nominal Value (Sensitivity)

Nominal Value g	Correction g	Uncertainty (\pm g)	Coverage Factor k
0.01	0.0000	0.000058	2
0.1	0.0000	0.000058	2
1	0.0000	0.000059	2
2	0.0000	0.000059	2
5	0.0000	0.000061	2
10	0.0000	0.000068	2
20	-0.0001	0.00008	2
50	0.0000	0.00009	2
100	0.0000	0.00014	2
120	-0.0001	0.00018	2
150	-0.0001	0.00020	2
200	-0.0001	0.00027	2

Checked by : Pakorn H.

Certificate No.: MC 2300848

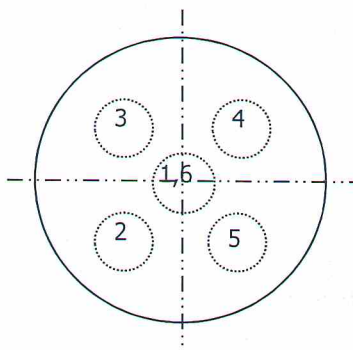
Page 3 of 3

Page 3 of 3

4. Off-Centre Loading

A mass of approximately 100 g was placed and moved to various positions on the pan.

The balance error readings from the centre obtained are given in the table.



Position (g)	Position (g)	Position (g)	Position (g)	Position (g)	Position (g)
1	2	3	4	5	6
100.0000	99.9998	99.9999	100.0006	100.0010	100.0000

Maximum difference from the centre : 0.0010 g

* This calibration report do not cover the effect that is happen from sensitivity drift.

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

This report will certify of the calibrated equipment only.

End of Certificate

Checked by : Pakorn H.