

ภาคผนวกที่ 5
เอกสารสอบเทียบเครื่องมือวิเคราะห์



Certificate of Calibration

Equipment:	pH METER	Certificate No.:	C07220454
Model:	PH 7310	Issued Date:	9 September 2022
Serial No. (or ID.):	22241035	Job No.:	KSPR2211066
Manufacturer:	WTW	Page:	1 of 3
Electrode Serial No.:	B222607002	Model:	SenTix 81
Condition:	In Condition	Brand:	WTW

Customer: GEM ENVIRONMENTAL MANAGEMENT CO.,LTD (SUARNABHUMI)
WASTEWATER TREATMENT PLANT, SUARNABHUMIAIRPORT
999 MOO 1 NONGPRUE, BANGPHLI, SAMUTPRAKAN 10540

Environment Condition:

Temperature	26.5	°C	±	0.2	°C
Humidity	63.8	%RH	±	4.9	%RH

Calibration Place: GEM ENVIRONMENTAL MANAGEMENT CO.,LTD (SUARNABHUMI)
(ห้องปฏิบัติการวิทยาศาสตร์)
WASTEWATER TREATMENT PLANT, SUARNABHUMIAIRPORT
999 MOO 1 NONGPRUE, BANGPHLI, SAMUTPRAKAN 10540

Calibration By: Mr. Piyapat Saidoung

Calibration Date: 7 September 2022

The Method used: In house method, CAL-WI-58, base on ASTM E 70-07

Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Hamed cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 794132, 794134, 794133 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20220100EA

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Calibration Results:

pH Scale

Input (mV)	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	414.3	0.18	0.001	0.065	2.00
354.96	355.1	0.14	1.001	0.065	2.00
295.8	295.9	0.10	2.001	0.065	2.00
236.64	236.8	0.16	3.001	0.065	2.00
177.48	177.6	0.12	4.000	0.065	2.00
118.32	118.5	0.18	5.000	0.065	2.00
59.16	59.3	0.14	6.000	0.065	2.00
0	0.1	0.10	7.000	0.065	2.00
-59.16	-59.0	0.16	8.000	0.065	2.00
-118.32	-118.2	0.12	9.000	0.065	2.00
-177.48	-177.4	0.08	10.000	0.065	2.00
-236.64	-236.6	0.04	11.000	0.065	2.00
-295.8	-295.7	0.10	11.999	0.065	2.00
-354.96	-354.9	0.06	12.999	0.065	2.00
-414.12	-413.9	0.22	13.998	0.065	2.00

Electrode Test Results*

The three-point calibration using three standard buffer solutions; pH 4.008 , pH 6.985 and pH 10.015

The practical slope of the pH electrode; 58.52 (mV/pH), 98.91%

The zero point of the pH electrode; 6.82 (pH)

Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	4.004	-0.004	0.0070	2.00
6.985	6.994	0.009	0.0085	2.00
10.015	10.009	-0.006	0.013	2.00

* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2211066

ชนิดเครื่องมือ: pH METER

รุ่น: PH 7310

หมายเลขเครื่อง: 22241035

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
07 Sep 2022			07 Sep 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<i>General</i>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Swich)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<i>Spectrophotometer</i>			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) ≥ 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV $< 3,000$ hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible $< 5,000$ hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>pH Meter and Conductivity Meter</i>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<i>Turbidimeter</i>			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (≥ 2.5 ไม่เกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>Automatic titrator</i>			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ :



Certificate of Calibration

Equipment:	Digital Thermometer	Certificate No.: C15220421
Model:	pH7310	Issued Date: 09 September 2022
Serial No.(or ID):	22241035	Job No.: KSPR2211067
Manufacturer:	inoLab	Page: 1 of 2
Condition:	In Condition	

Customer: GEM ENVIRONMENTAL MANAGEMENT CO.,LTD (SUARNABHUMI)
WASTEWATER TREATMENT PLANT, SUARNABHUMIAIRPORT
999 MOO 1 NONGPRUE, BANGPHLI, SAMUTPRAKAN 10540

Environment Condition: Temperature: 22 °C ± 3.0 °C
Humidity: 50 %RH ± 15.0 %RH
Voltage: 230 VAC ± 11.0 VAC

Calibration Place: Sensor Laboratory, DKSH Technology Limited.
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,
Bangchak, Prakhnong, Bangkok 10260 Thailand

Calibration By: Mr. Tweewong Thaithiang

Calibration Date: 08 September 2022

The Method used: In house method, CAL-WI-19, by comparison with standard thermometer

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Quality Reborn Co.,Ltd. (QR) Certificate No. QR22-0366

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ

เลขที่ใบงาน: KSPR2211067

ชนิดเครื่องมือ: Digital Thermometer

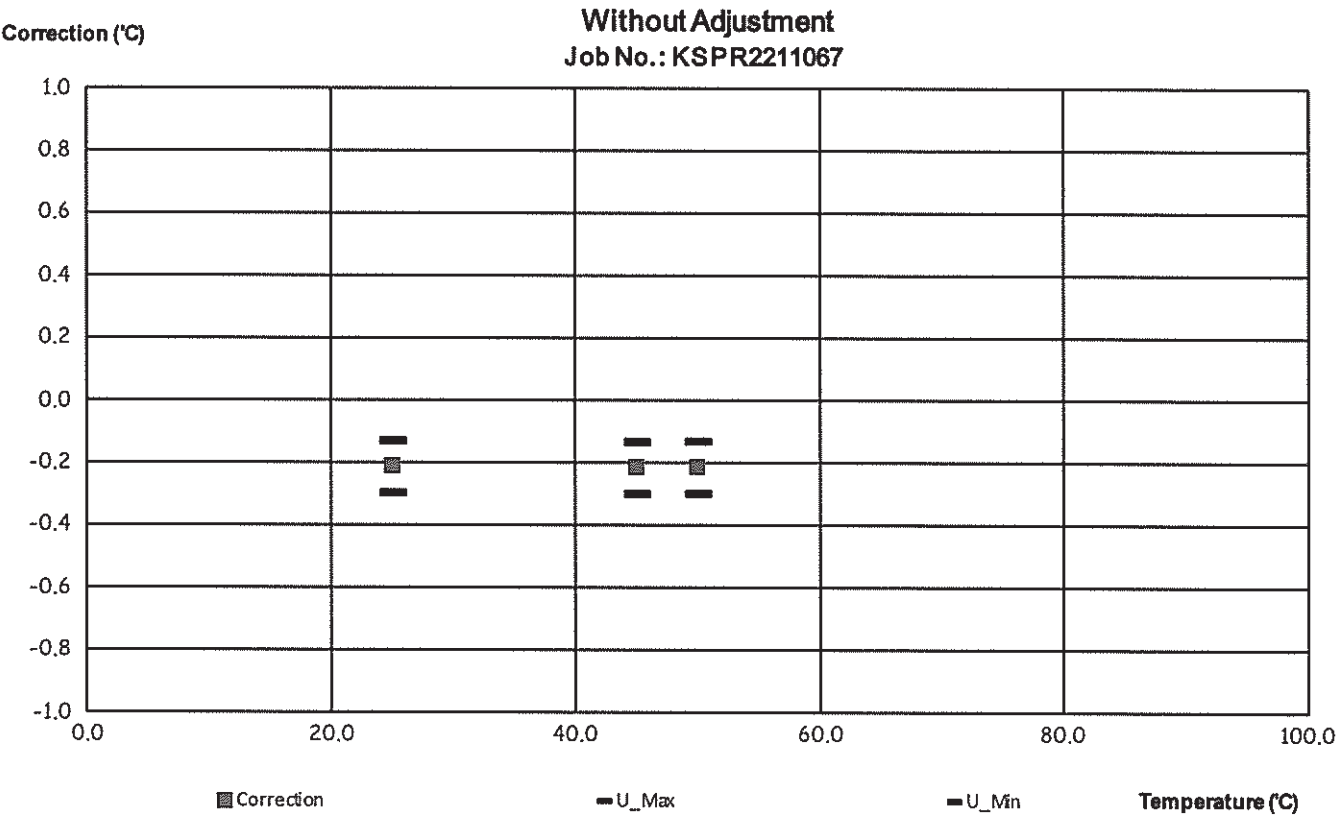
รุ่น: pH7310

หมายเลขเครื่อง: 22241035

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
8-Sep-2022			8-Sep-2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Adaptor
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. Battery	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Adaptor
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Sensor (In / Ex)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :







CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : HANNA INSTRUMENTS
MODEL / TYPE : HI98191/HI72911/HI7662
SERIAL NO. : 03220019991/094706CN/05162A4N[LE-SVP-006]
CLID. NO. : 272300953
JOB CONTROL NO. : 230405037853

CUSTOMER : GLOBAL UTILITIES SERVICES CO., LTD.
WASTEWATER TREATMENT PLANT, SUVARANBHUMIAIRPORT
999 MOO 1 NHONGPROR, BANG PHLI, SAMUT PRAKARN 10540

DATE OF RECEIVED : 05 April 2023

DATE OF ISSUED : 10 April 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Approved By :

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23037853

F3-011-04/01-12

page 1 of 5





CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : HANNA INSTRUMENTS
MODEL / TYPE : HI98191/HI72911/HI7662
SERIAL NO. : 03220019991/094706CN/05162A4N[LE-SVP-006]
DATE OF CALIBRATION : 06 April 2023

ENVIRONMENT CONDITIONS :

Temperature : $(25 \pm 2.5) ^\circ\text{C}$

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

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-01** [pH Meter]. The calibration was performed by direct measurement with Certified Reference Material (CRM) and Documenting Process Calibrator.

This instrument was calibrated under procedure No. **CLC-CPTH-04** [pH Temperature] based on **ASTM E 644-04** as calibration guidelines. The calibration was performed by using Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Documenting Process Calibrator , Fluke Model 702 S/N. 6630202.
2. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
3. pH Standard Solution, Control Company Catalog Number 06-664-260,11754256, Lot Number CC728484.
4. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
5. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03.
6. IPRT, ASL Model T100-250-1D S/N. L0193A-1-1.

Certificate No. Q23037853

F3-011-04/01-12

page 2 of 5





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CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.

Certificate No. Q22121340, Due Date 01 December 2023.

2. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).

Lot Number. 160221 , 180121. Due Date 05 May 2023.

3. The measurements are traceable to International System of Units (SI) , through Control Company.

Certificate No. 4281-12405788 , Due Date 30 June 2023.

4. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.

Certificate No. Q22130792, Due Date 05 January 2024.

5. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0010/66, Due Date 06 November 2023.

6. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).

Certificate No. TT-0166-22, Due Date 01 December 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23037853

F3-011-04/01-12

page 3 of 5





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CALIBRATION LABORATORY Co., LTD.

2/10-11,14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

CALIBRATION DATA

1. pH ELECTRODE RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement (\pm pH)	k Factor
4.000	4.00	177.5	0.000	0.012	2,20
6.996	7.01	2.8	-0.014	0.015	2,06
10.007	10.02	-178.2	-0.013	0.015	2,05

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 2,3 of 54

2. pH SCALES RESULT @ 25 °C

Standard Voltage Input (mV)	pH Meter Reading		Correction (mV)	Uncertainty of Measurement (\pm mV)	k Factor
	(mV)	(pH)			
414.11	413.4	0.01	+0.71	0.06	2,00
177.48	176.8	4.00	+0.68	0.06	2,00
0.00	-0.7	7.00	+0.70	0.06	2,00
-177.48	-178.1	10.01	+0.62	0.06	2,00
-414.11	-414.7	14.01	+0.59	0.06	2,00

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 11 of 54

Certificate No. Q23037853

F3-011-04/01-12

page 4 of 5



@clccalibration



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CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CALIBRATION DATA

3. TEMPERATURE RESULT

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty \pm (°C)
100	25.00	25.1	-0.10	0.07
	40.00	40.1	-0.10	
	50.00	50.0	0.00	

Note. Probe \varnothing 4 mm

Materials : Metal Sheath.

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2,00$.

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 47 of 54

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q23037853

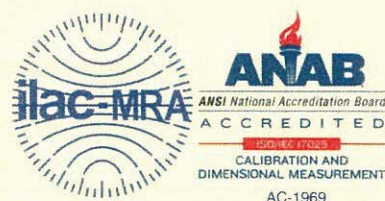
F3-011-04/01-12

page 5 of 5





MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Sep 28, 2022

Cert No. 551220085366910

Customer:

GEM ENVIRONMENTAL MANAGEMENT CO., LTD. (SUARNABHUMI)

WASTEWATER TREATMENT PLANT
SUARNABHUMIAIRPORT
999 MOO 1 NONGPRUE,
BANGPHLI, SAMUTPRAKAN 10540

Work Order #: THAI-32244130

MPC Control #: EG2373

Serial Number: 22091421

Asset ID: N/A

Department: N/A

Gage Type: BOD INCUBATOR

Performed By: PAKPOOM LUANGSUKSOPHON

Manufacturer: WST

Received Condition: OPERATIONAL

Model Number: WST-BOD396L

Returned Condition: REPORT OF VALUE

Size: N/A

Cal. Date: September 27, 2022

Temp/RH: 22.3°C / 62.0%

Cal. Interval: 12 MONTHS

Location: Calibration performed at Customer's facility

Cal. Due Date: September 27, 2023

Calibration Notes:

The user shall determine the suitability of the equipment for its intended use. The calibration status is defined as Report of Value. Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AX9723	DATA ACQUISITION SWITCH UNIT	34970A	US37019039	AGILENT	Jul 1, 2023	551220085178878 / MP-TH

Procedures Used in this Event

Procedure Name

Description

THAI LAB ACC G-20

Guidelines for Calibration and Checks of Temperature Controlled Enclosures
Publication Reference

Calibrating Technician:

QC Approval:

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994, ANSI/NCSL Z540.3-2006, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

Calibration Report of WST WST-BOD396L BOD INCUBATOR

MPC Control #:	EG2373	Serial Number:	22091421
Asset ID:	N/A	Calibration Date:	September 27, 2022

Measurement Results

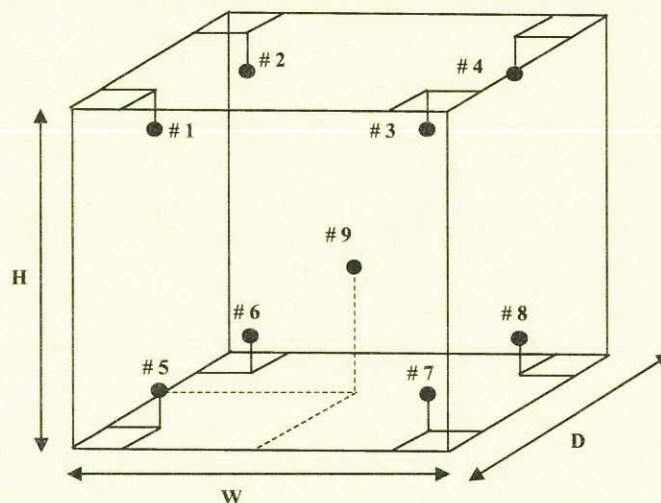
Section 1-Temperature Distribution

Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.9 Reference									Uncertainty (°C)
	Sensor No.1	Sensor No.2	Sensor No.3	Sensor No.4	Sensor No.5	Sensor No.6	Sensor No.7	Sensor No.8	Sensor No.9	
20.0	20.05	19.76	19.55	19.94	19.92	19.89	19.98	19.93	19.68	± 0.35

Section 2-Chamber Performance

Setting Temp (°C)	Indicating Temp (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	20.0	1.28	0.73	1.87

Sensor Installation Location



The user shall determine the suitability of the equipment for its intended use. The calibration status is defined as Report of Value.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor

$k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

End of Calibration Report



Certificate of Calibration

Certificate Number : SPR22080141-2

Page : 1 of 3

Customer : GEN ENVIRONMENTAL MANAGEMENT CO.,LTD (SUARNABHUMI)
WASTEWATER TREATMENT PLANT, SUARNABHUMIAIRPORT 999
MOO 1 NONGPRUE, BANGPHLI, SAMUTPRAKAN 10540

Equipment Name : Electronic Balance

Manufacturer : Sartorius

Model : BSA224S-CW

Serial Number : 3142616377

ID. Number : N/A

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 09 Aug 2022

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

Calibration Date : 10 Aug 2022

Location of Calibration : In-Lab

Recommend Due Date : N/A

Calibration Procedure : SP-CPM-04-01

Date of Issue : 11 Aug 2022

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by :



Approved by :





Calibration Report

Certificate Number : SPR22080141-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Standard Weight Set	Class E2	B746971965	C02203624	02 Oct 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
SPC - SPC Calibration Center Co;Ltd.



Result of Calibration

Certificate No. : SPR22080141-2

Page : 3 of 3

Range capacity : 0 to 220 g

Resolution: 0.0001 g

Repeatability (n = 10 number of measurement)

Standard Weight (g)	Standard Deviation
200	0.00007

Departure of indication from nominal Value

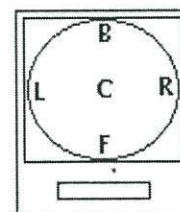
Unit : g

Nominal Value	UUC Reading	Error	Uncertainty (±)
No Load	0.0000	0.0000	0.000058
20.0	20.0000	0.0000	0.000085
40.0	40.0000	0.0000	0.000096
60.0	60.0000	0.0000	0.00011
80.0	80.0000	0.0000	0.00016
100.0	99.9999	-0.0001	0.00016
120.0	119.9999	-0.0001	0.00020
140.0	140.0000	0.0000	0.00020
160.0	159.9999	-0.0001	0.00030
180.0	179.9999	-0.0001	0.00030
200.0	199.9999	-0.0001	0.00030

Off – Center Loading

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

Center	99.9999 g
Front	100.0000 g
Back	99.9998 g
Left	99.9998 g
Right	99.9999 g
Maximum difference	0.0001 g



Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2$, providing a level of confidence approximately 95%

- End of Certificate -

SP-FM-04-15 REV.0

**QUALITY CALIBRATION CO.,LTD.**

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com



CERTIFICATE No : 22T10252

REFERENCE No : 66658-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : HOT AIR OVEN

MANUFACTURER : MEMMERT

MODEL : UF 55

SERIAL No : B222.032

ID No : N/A

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : GEM ENVIRONMENTAL MANAGEMENT CO., LTD.
(SUARNABHUMI)
WASTEWATER TREATMENT PLANT,
SUARNABUMIAIRPORT, 999 MOO.1 NONGPRUE,
BANGPHLI, SAMUTPRAKAN 10540

CALIBRATED BY :**CALIBRATION DATE** :**APPROVED BY** :**ISSUED DATE** :**RECEIVED DATE** :



CERTIFICATE No : 22T10252

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UF 55
ID No : N/A
RECEIVED DATE : 23-Sep-22
AMBIENT TEMPERATURE : 26 °C ± 1 °C

S/N : B222.032
CALIBRATION DATE : 23-Sep-22
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

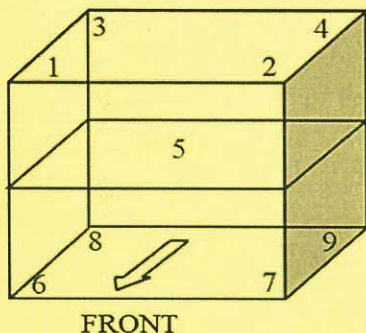
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

2. REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) DATA LOGGER WITH RTD	HYDRA 2635A	7408027	22T7510	10-Jul-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 0
Overall Line Voltage (V) variation : 1
Instrument Condition : Normal
Chamber Size (W*L*H): 40*33*40 cm

CHAMBER PERFORMANCE

Calibrate Point (°C)	Controller Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	0.07	0.12	0.25

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	104.26	104.23	104.18	104.22	104.18	104.20	104.09	104.26	104.17	0.38

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2: LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT QC LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

LE-SVP-004



CERTIFICATE No : 22T10251

REFERENCE No : 66658-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : HOT AIR OVEN

MANUFACTURER : MEMMERT

MODEL : UF 55

SERIAL No : B222.033

ID No : N/A

CONDITION AS RECEIVED : NEW ITEM

SUBMITTED BY : GEM ENVIRONMENTAL MANAGEMENT CO., LTD.
(SUARNABHUMI)
WASTEWATER TREATMENT PLANT,
SUARNABUMIAIRPORT, 999 MOO.1 NONGPRUE,
BANGPHLI, SAMUTPRAKAN 10540

CALIBRATED BY :

CALIBRATION DATE :

APPROVED BY :

ISSUED DATE :

RECEIVED DATE :



CERTIFICATE No : 22T10251

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UF 55
ID No : N/A
RECEIVED DATE : 23-Sep-22
AMBIENT TEMPERATURE : 26 °C ± 1 °C

S/N : B222.033
CALIBRATION DATE : 23-Sep-22
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

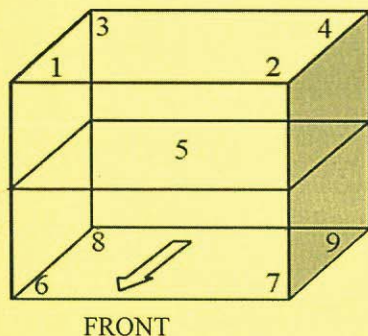
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOCOUPLE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

2. REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	7408027	22T7510	10-Jul-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 0
Overall Line Voltage (V) variation : 3
Instrument Condition : Normal
Chamber Size (W*L*H): 40*33*40 cm

CHAMBER PERFORMANCE

Calibrate Point (°C)	Controller Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
180.0	180.0	0.17	0.59	0.83

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
180.0	180.0	180.18	179.80	179.97	179.94	180.07	179.51	179.79	179.65	179.99	1.1

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2: LOCATION 5 WAS REFERENCE LOCATION.

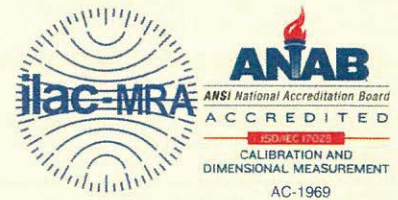
NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT QC LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



MICRO PRECISION CALIBRATION LABORATORY (THAILAND) CO., LTD.
413 BONDSTREET ROAD, TAMBOL BANGPOODAMPHOE PAKKRED, NONTABURI
NONTABURI 11120 THAILAND
66 2 583 9834



Certificate of Calibration

Date: Sep 28, 2022

Cert No. 551220085366911

Customer:

GEM ENVIRONMENTAL MANAGEMENT CO., LTD. (SUARNABHUMI)
WASTEWATER TREATMENT PLANT
SUARNABHUMIAIRPORT
999 MOO 1 NONGPRUE,
BANGPHLI, SAMUTPRAKAN 10540

Work Order #: THAI-32244130

MPC Control #:	EG2374	Serial Number:	22091420
Asset ID:	N/A	Department:	N/A
Gage Type:	REFRIGERATOR	Performed By:	PAKPOOM LUANGSUKSOPHON
Manufacturer:	WST	Received Condition:	OPERATIONAL
Model Number:	WST-396L	Returned Condition:	REPORT OF VALUE
Size:	N/A	Cal. Date:	September 27, 2022
Temp/RH:	22.3°C / 62.0%	Cal. Interval:	12 MONTHS
Location:	Calibration performed at Customer's facility	Cal. Due Date:	September 27, 2023

Calibration Notes:

The user shall determine the suitability of the equipment for its intended use. The calibration status is defined as Report of Value. Please refer to the attached Calibration Report (1 page)

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AX9723	DATA ACQUISITION SWITCH UNIT	34970A	US37019039	AGILENT	Jul 1, 2023	551220085178878 / MP-TH

Procedures Used in this Event

Procedure Name	Description
THAI LAB ACC G-20	Guidelines for Calibration and Checks of Temperature Controlled Enclosures Publication Reference

Calibrating Technician:



QC Approval:



The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2017, ANSI/NCCL Z540-1-1994, ANSI/NCCL Z540.3-2006, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

Calibration Report of WST WST-396L Refrigerator

MPC Control #:	EG2374	Serial Number:	22091420
Asset ID:	N/A	Calibration Date:	September 27, 2022

Measurement Results

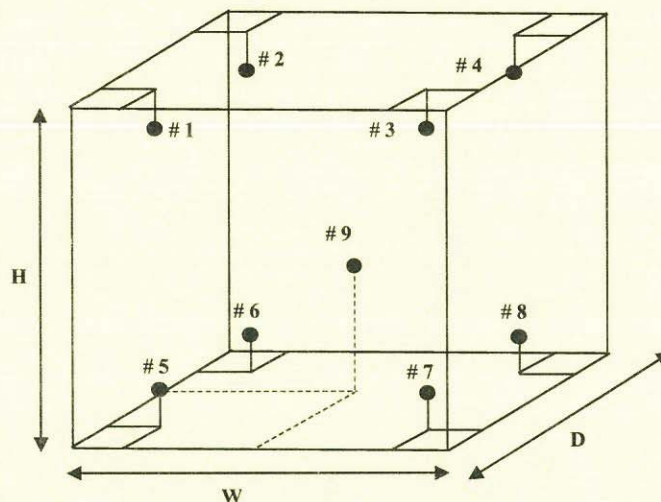
Section 1-Temperature Distribution

Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.9 Reference									Uncertainty (°C)
	Sensor No.1	Sensor No.2	Sensor No.3	Sensor No.4	Sensor No.5	Sensor No.6	Sensor No.7	Sensor No.8	Sensor No.9	
3.0	3.60	2.74	3.38	3.02	2.28	2.34	2.89	3.70	2.58	± 0.35

Section 2-Chamber Performance

Setting Temp (°C)	Indicating Temp (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
3.0	3.0	1.54	1.11	3.20

Sensor Installation Location



The user shall determine the suitability of the equipment for its intended use. The calibration status is defined as Report of Value.

The expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%, unless otherwise stated.

End of Calibration Report



บริษัท กิตติสิทธิ์ เ็นเตอร์ไพรส์ จำกัด (สำนักงานใหญ่)

KITTISIT ENTERPRISE CO.,LTD

38/76, 38/77 หมู่ 3 ตำบลคูคต อำเภอลำลูกกา จังหวัดปทุมธานี 12130

โทร : 02-991-0963 แฟกซ์ : 02-991-0986 มือถือ : 089-455-1486

E-mail sale@ktssci.com ,www.ktssci.com



CERTIFICATE OF CALIBRATION

Certificate No : 22-067

Page : 1 of 5

Customer : GEM ENVIRONMENTAL MANAGEMENT CO.,LTD (SUVARNABHUMI)

Address : WASTEWATER TREATMENT PLANT , SUVARNABHUMI AIRPORT
999 MOO 1 NONGPRUE , BANGPHLI , SAMUTPRAKAN 10540

Instrument : UV/Vis Spectrophotometer

Manufacturer : PERSEE

Model : T8DCS

Serial Number : 31-0197-00-0024

Environment : Temperature (Before 27.7 °C , After 28.2 °C)
: Humidity (Before 63.6 %RH , After 62.4 %RH)

Received Date : 13/9/2022

Calibration Date : 11/10/2022

Issue Date : 21/9/2022

Calibration Status : No Adjustment

Calibration Area : Onsite Laboratory Room

Calibrated By

Approved By

F-2401-01/26-07-60

Certificate No : 22-067

Page : 2 of 5

1. Wavelength Accuracy

Spectral slit width: 1.00 nm

1.1 CRMs : Holmium Glass Filter

Traceability : Traceable to the International System of Unit through Starna Certificate

94650

Filter STDs(nm) Certificate	Average Measuring Value(nm)	Correction (nm)	Uncertainty ±(nm)
241.70	241.30	0.40	0.12
279.44	279.20	0.24	0.12
287.71	287.50	0.21	0.12
334.02	333.70	0.32	0.12
360.89	360.60	0.29	0.12
418.53	418.70	-0.17	0.12
453.67	453.50	0.17	0.12
459.99	459.80	0.19	0.12
536.52	537.00	-0.48	0.12
638.00	638.10	-0.10	0.12

1.2 CRMs : Didymium Glass Filter

Traceability : Traceable to the International System of Unit through Starna Certificate

94647

Filter STDs(nm) Certificate	Average Measuring Value(nm)	Correction (nm)	Uncertainty ±(nm)
585.19	585.30	-0.11	0.12
684.50	684.80	-0.30	0.12
741.02	740.90	0.12	0.12
748.56	748.60	-0.04	0.12
807.02	807.10	-0.08	0.12

F-2401-01/26-07-60

2. Photometric Accuracy

Certificate No : 22-067

CRMs : Neutral Density Glass Filters

Page : 3 of 5

Traceability: Traceable to the International System of Unit through Starna Certificate

94683

Spectral slit width: 1.00 nm

2.1 Reading scale at 420.0 nm. (* Not Accredited)

Filter STDs (Abs.) Certificate	Average Measuring Value (A)	Correction (A)	Uncertainty ±(A)
0.0000	0.0000	0.0000	0.0028
0.5732	0.5710	0.0022	0.0056
0.7135	0.7120	0.0015	0.0050
1.0269	1.0250	0.0019	0.0034

2.2 Reading scale at 440.0 nm.

Filter STDs (Abs.) Certificate	Average Measuring Value (A)	Correction (A)	Uncertainty ±(A)
0.0000	0.0000	0.0000	0.0028
0.5582	0.5560	0.0022	0.0056
0.7019	0.7000	0.0019	0.0050
1.0099	1.0090	0.0009	0.0034

2.3 Reading scale at 465.0 nm.

Filter STDs (Abs.) Certificate	Average Measuring Value (A)	Correction (A)	Uncertainty ±(A)
0.0000	0.0000	0.0000	0.0028
0.5209	0.5190	0.0019	0.0053
0.6631	0.6610	0.0021	0.0049
0.9531	0.9510	0.0021	0.0032

Certificate No : 22-067

Page : 4 of 5

2.4 Reading scale at 546.1 nm.

Filter STDs (Abs.) Certificate	Average Measuring Value (A)	Correction (A)	Uncertainty ±(A)
0.0000	0.0000	0.0000	0.0028
0.5224	0.5190	0.0034	0.0043
0.6997	0.6950	0.0047	0.0041
1.0066	1.0020	0.0046	0.0028

2.5 Reading scale at 590.0 nm.

Filter STDs (Abs.) Certificate	Average Measuring Value (A)	Correction (A)	Uncertainty ±(A)
0.0000	0.0000	0.0000	0.0028
0.5564	0.5530	0.0034	0.0038
0.7750	0.7700	0.0050	0.0037
1.1171	1.1110	0.0061	0.0029

2.6 Reading scale at 635.0 nm.

Filter STDs (Abs.) Certificate	Average Measuring Value (A)	Correction (A)	Uncertainty ±(A)
0.0000	0.0000	0.0000	0.0028
0.5638	0.5600	0.0038	0.0035
0.7644	0.7610	0.0034	0.0035
1.1014	1.0970	0.0044	0.0029



บริษัท กิตติสิทธ์ เอ็นเตอร์ไพรส์ จำกัด (สำนักงานใหญ่)

KITTISIT ENTERPRISE CO.,LTD

38/76, 38/77 หมู่ 3 ตำบลอุกค อำเภอลำลูกกา จังหวัดปทุมธานี 12130

โทร : 02-991-0963 แฟกซ์ : 02-991-0986 มือถือ : 089-455-1486

E-mail sale@ktssci.com ,www.ktssci.com



Certificate No : 22-067

Page : 5 of 5

3. Photometric Accuracy

CRMs : Potassium Dichromate 60 mg/l

CRMs Serial Number : 35553

Blank Serial Number : 105079

Traceability : Traceable to NIST through Starna Certificate

94662

Spectral slit width :

1.00 nm

	Certificate (Abs.)	Average Measuring Value (A)	Correct (A)	Uncertainty ±(A)
Blank	0.0000	0.0000	0.0000	0.0049
235 nm	0.7454	0.7460	-0.0006	0.0062
Blank	0.0000	0.0000	0.0000	0.0049
257 nm	0.8651	0.8660	-0.0009	0.0058
Blank	0.0000	0.0000	0.0000	0.0049
313 nm	0.2895	0.2930	-0.0035	0.0052
Blank	0.0000	0.0000	0.0000	0.0049
350 nm	0.6415	0.6390	0.0025	0.0052

4. Stray Light (*Not Accredited)

CRMs : Potassium Iodide aqueous solution

CRM Serial Number :

35557

Traceability : Traceable to NIST through Starna Certificate

94670

Spectral slit width:

1.00 nm

Wavelength (nm)	Certificate	Average Measuring
260.3	>2A	9.9990
260.3	<1%T	0.10

Note

1. Calibration Method

1.1 Wavelength Accuracy : Measuring Wavelength by CRMs base on ASTM E925/ASTM E275-08

1.2 Photometric Accuracy : Measuring Absorbance by CRMs based on ASTM E925/ASTM E275-08

1.3 Stray light : Measuring Absorbance and Transmittance by CRMs base on ASTM E387

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

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

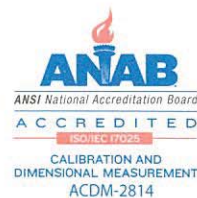
4. This certificate was certificate only for the our calibrated instrument.

F-2401-01/26-07-60



CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-200 °C
SERIAL NO. : N/A[LE-SVP-041]
CLID. NO. : 232100431
JOB CONTROL NO. : 210212014043

CUSTOMER : GLOBAL UTILITIES SERVICES CO., LTD.
WASTEWATER TREATMENT PLANT, SUVARANBHUMIAIRPORT
999 MOO 1 NHONGPROR, BANG PHLI, SAMUT PRAKARN 10540

DATE OF RECEIVED : 12 February 2021

DATE OF ISSUED : 16 February 2021

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Approved By :

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q21014043

F3-011-04/01-12

page 1 of 3



@clcalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : **LIQUID IN GLASS THERMOMETER**
MANUFACTURER : **AA PRECISION**
MODEL / TYPE : **0-200 °C**
SERIAL NO. : **N/A[LE-SVP-041]**
DATE OF CALIBRATION : **15 February 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-02** based on **ASTM E 77-07** as calibration guidelines.

The calibration was performed by comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Calibration Bath, Kambic Model OB-22/2 ULT,OB-22/2 S/N. 17115653,17115654.
2. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03 with IPRT S/N. PO00043543-1-10-1,PO00043543-1-10-19, H0191A ITEM6/12,L1123A-1-5.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd. Certificate No. Q21006472,Q21005382. Due Date 23 January 2022,20 January 2022.
2. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Certificate No. ER-0032-20,TT-0095-20,TT-0096-20,TT-0127-20,TT-0108-20. Due Date 09 April 2021,01 October 2021,18 December 2021,30 October 2021.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. **Q21014043**

F3-011-04/01-12

page 2 of 3



@clcalibration

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC Reading were recorded and the means value were reported of four times measurement in the table below.

CALIBRATION DATA

CORRECTION OF TEMPERATURE

STD Reading (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty \pm (°C)
0.10	0.0	+ 0.10	0.13
103.91	104.0	- 0.09	
180.00	180.0	0.00	

Range : 0 °C to 200 °C

Graduation : 0.5 °C

Immersion Type : Total Immersion.

Correction of Reference Temperature (0 °C) = 0.1 °C

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 006 Page 46 of 57

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q21014043

F3-011-04/01-12

page 3 of 3



@clccalibration



CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-50 °C
SERIAL NO. : N/A[LE-SVP-072]
CLID. NO. : 232100486
JOB CONTROL NO. : 210213014834

CUSTOMER : GLOBAL UTILITIES SERVICES CO., LTD.
WASTEWATER TREATMENT PLANT, SUVARANBHUMIAIRPORT
999 MOO 1 NHONGPROR, BANG PHLI, SAMUT PRAKARN 10540

DATE OF RECEIVED : 13 February 2021

DATE OF ISSUED : 17 February 2021

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Approved By :



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q21014834

F3-011-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-50 °C
SERIAL NO. : N/A[LE-SVP-072]
DATE OF CALIBRATION : 16 February 2021

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPH-02 based on ASTM E 77-07 as calibration guidelines.

The calibration was performed by comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
2. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03 with IPRT S/N. PO00043543-1-10-1, PO00043543-1-10-19.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd. Certificate No. Q21006472, Due Date 23 January 2022.
2. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Certificate No. ER-0032-20, TT-0095-20, TT-0096-20. Due Date 09 April 2021, 01 October 2021.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21014834

F3-011-04/01-12

page 2 of 3



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC Reading were recorded and the means value were reported of four times measurement in the table below.

CALIBRATION DATA

CORRECTION OF TEMPERATURE

STD Reading (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty \pm (°C)
-0.006	0.00	- 0.006	0.042
2.991	3.00	- 0.009	
19.989	20.00	- 0.011	
24.992	25.00	- 0.008	

Range : 0 °C to 50 °C

Graduation : 0.1 °C

Immersion Type : Total Immersion.

Correction of Reference Temperature (0 °C) = 0.00 °C

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 006 Page 46 of 57

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q21014834

F3-011-04/01-12

page 3 of 3

