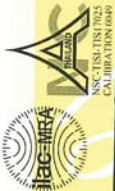


เอกสารแนบ 6

เอกสารสอบเทียบเครื่องมือที่ใช้ในการ
ตรวจวิเคราะห์



CERTIFICATE No : 23M9027
REFERENCE No : 70588-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BSA224S-CW
SERIAL No : 3142616377
ID No : LE-SVP-001
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : GEM ENVIRONMENTAL MANAGEMENT CO., LTD.
(SUARNABHUMI)
WASTEWATER TREATMENT PLANT,
SUARNABUMAIRPORT, 999 MOO.1
NONGPRUE, BANGPHLI, SAMUTPRAKAN 10540
CALIBRATED BY : [REDACTED]
CALIBRATION DATE : 18-Sep-23
APPROVED BY : [REDACTED]
ISSUED DATE : 29-Sep-23
RECEIVED DATE : 18-Sep-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 23M9027

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BSA224S-CW
ID No : 3142616377
AIR PRESSURE : 1010mbar \pm 2mbar
AMBIENT TEMPERATURE : 25°C \pm 1°C
RECEIVED DATE : 18-Sep-23
CALIBRATION DATE : 18-Sep-23
RELATIVE HUMIDITY : 50% RH \pm 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

- 1) STANDARD WEIGHT SET
E2
2) STANDARD WEIGHT
E2
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE 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 CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

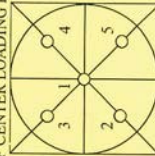
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000082
0.1	0.1000	0.0000	0.000083
0.2	0.2000	0.0000	0.000083
0.5	0.5000	0.0000	0.000083
1.0	1.0000	0.0000	0.000084
2.0	2.0000	0.0000	0.000086
5.0	5.0000	0.0000	0.000089
10.0	10.0000	0.0000	0.000094
20.0	20.0001	-0.0001	0.00012
50.0	50.0000	0.0000	0.00019
100.0	100.0001	-0.0001	0.00032
200.0	200.0000	0.0000	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	99.9999
3	99.9999
4	100.0000
5	99.9999
OFF-CENTER LOADING	0.0001

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT 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



CERTIFICATE No : 23M9026
REFERENCE No : 70588-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BSA3202S-CW
SERIAL No : 3142612617
ID No : LE-SVP-002

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 : 18-Sep-23

APPROVED BY : 
ISSUED DATE : 29-Sep-23
RECEIVED DATE : 18-Sep-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 23M9026

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
ID No : LE-SVP-002
AIR PRESSURE : 1012mbar \pm 1mbar
AMBIENT TEMPERATURE : 25°C \pm 1°C
RELATIVE HUMIDITY : 50%RH \pm 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	---	0094-51	23M1296	07-Feb-24
2) STANDARD WEIGHT	---	OK-1-009	23M1297	18-Feb-24
3) STANDARD WEIGHT	---	OK-1-010	M2302003S	01-Feb-25

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE 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)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

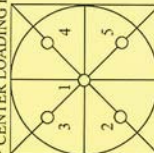
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 2500 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.00	0.00	0.012
5.0	5.00	0.00	0.012
10.0	10.00	0.00	0.012
20.0	20.00	0.00	0.012
50.0	50.00	0.00	0.012
100.0	100.00	0.00	0.012
200.0	200.00	0.00	0.012
500.0	500.00	0.00	0.012
1000.0	1000.00	0.00	0.012
2000.0	2000.00	0.00	0.012
3000.0	3000.00	0.00	0.012

5. ZERO OFF CENTER LOADING ERROR



POINT	READING (g)
1	1000.00
2	1000.00
3	1000.00
4	1000.00
5	1000.00
OFF-CENTER LOADING	0.00

NOTE : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT 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, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 23T9028
REFERENCE No : 70588-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UF55
SERIAL No : B222.032
ID No : LE-SVP-003
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : GEM ENVIRONMENTAL MANAGEMENT CO., LTD.
(SUVARNABHUMI)
WASTEWATER TREATMENT PLANT,
SUVARNABUMIAIRPORT, 999 MOO.1 NONGPRUE,
BANGPHLI, SAMUTPRAKAN 10540

CALIBRATED BY : 
CALIBRATION DATE : 18-Sep-23

APPROVED BY : 
ISSUED DATE : 29-Sep-23
RECEIVED DATE : 18-Sep-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
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QUALITY CALIBRATION CO.,LTD.

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CERTIFICATE No : 23T9028

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UF55
ID No : LE-SVP-003
RECEIVED DATE : 18-Sep-23
AMBIENT TEMPERATURE : 26 °C ± 1 °C
S/N : B222.032
CALIBRATION DATE : 18-Sep-23
RELATIVE HUMIDITY : 54 %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.

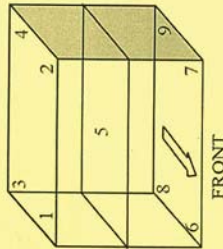
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :
1) DATA LOGGER WITH RTD HYDRA 2635A 7301307 23T6636 10-Jul-24
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE 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 : 4
Instrument Condition : Normal
Chamber Size (W*L*H): 40*33*40 cm



CHAMBER PERFORMANCE					Overall Variation (°C)
Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Temperature Variation (°C)	
104.0	104.0	0.06	0.50	0.50	0.64

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	103.84	104.01	104.02	104.04	104.22	104.32	103.94	104.24	104.38	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 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



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Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 23T9029
REFERENCE No : 70588-4

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UF55
SERIAL No : B222.033
ID No : LE-SVP-004
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 : 18-Sep-23

APPROVED BY : 
ISSUED DATE : 29-Sep-23
RECEIVED DATE : 18-Sep-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
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QUALITY CALIBRATION CO.,LTD.
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CERTIFICATE No : 23T9029

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UF55
ID No : LE-SVP-004
RECEIVED DATE : 18-Sep-23
AMBIENT TEMPERATURE : 26 °C ± 1 °C
S/N : B222.033
CALIBRATION DATE : 18-Sep-23
RELATIVE HUMIDITY : 55 %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 :-

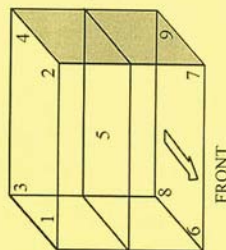
INSTRUMENT MODEL SERIAL No CERTIFICATE No DUE DATE
1) DATA LOGGER WITH TC TYPE K HYDRA 2655A 7301307 23T6636 10-Jul-24
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

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 : 1
Overall Line Voltage (V) variation : 4
Instrument Condition : Normal
Chamber Size (W*L*H): 40*30*40 cm



CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
180.0	180.0	0.16	1.14	1.24

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	179.64	179.70	179.63	179.97	180.64	179.99	179.75	179.50	80.03	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 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




CERTIFICATE No : 23E9032
REFERENCE No : 70588-7


PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : WTW
MODEL : PH7310
SERIAL No : 22241035
ID No : LE-SVP-005
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : GEM ENVIRONMENTAL MANAGEMENT CO., LTD.
(SUVARNABHUMI)

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

CALIBRATED BY : 
CALIBRATION DATE : 18-Sep-23

APPROVED BY : 
ISSUED DATE : 29-Sep-23
RECEIVED DATE : 18-Sep-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 23E9032

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : WTW
ID No : PH7310
RECEIVED DATE : 22241035
AMBIENT TEMPERATURE : 18-Sep-23
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062 AND WI-TQ-063. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READ THE VALUE COMPARED WITH CALCULATED VALUE. THE DISPLAY AND ELECTRODE WAS CALIBRATED BY USING STANDARD pH BUFFER REFERENCE STANDARD INSTRUMENTS :-
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No/ LOT No	CERTIFICATE No	DUE DATE
1) pH STANDARD SOLUTION	00651-06	CC767907	4880-13836406	29-Dec-24
2) pH STANDARD SOLUTION	00651-08	CC765602	4881-13757019	18-Nov-24
3) pH STANDARD SOLUTION	00651-10	CC767180	4882-13813369	14-Dec-24
4) PROCESS CALIBRATOR	CA150	91S6079	23E1312	19-Apr-24
5) BATH	260014	1247 48074	22T99014	13-Sep-24
6) THERMOMETER WITH PROBE	421504	55000379	22T9904	13-Oct-23

- THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-
- NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. DISPLAY UNIT ONLY

SLOPE FACTOR $k = 2.303 \text{ RT/F} = 59 \text{ mV/pH}$

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	413.8	0.31	-0.15	0.15	2.0
354.95	354.8	0.15	0.90	0.15	2.0
295.80	295.7	0.10	1.93	0.15	2.0
236.64	236.7	-0.06	2.97	0.15	2.0
177.48	177.7	-0.22	4.01	0.15	2.0
118.32	118.4	-0.08	5.05	0.15	2.0
59.16	59.3	-0.14	6.09	0.15	2.0
0.00	0.2	-0.20	7.13	0.15	2.0
-59.16	-59.0	-0.16	8.17	0.15	2.0
-118.32	-118.3	-0.02	9.22	0.15	2.0
-177.48	-177.3	-0.18	10.26	0.15	2.0
-236.64	-236.6	-0.04	11.30	0.15	2.0
-295.80	-295.8	0.00	12.34	0.15	2.0
-354.95	-355.1	0.15	13.38	0.15	2.0
-414.11	-414.2	0.09	14.42	0.15	2.0

END OF CALIBRATION REPORT PAGE 2 OF 3



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CERTIFICATE No : 23E9032

PAGE : 3 OF 3

Calibration Report

RESULT OF CALIBRATION (CONTINUE) :

2. DISPLAY UNIT WITH pH ELECTRODE S/N: B222607002

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (\pm pH)	COVERAGE FACTOR k
4.006	4.01	-0.004	---	0.012	2.0
6.999	7.00	-0.001	---	0.012	2.0
10.007	10.01	-0.003	---	0.014	2.0

3. PERCENT SLOPE 96.1%

4. DISPLAY UNIT MEASUREMENT TEMPERATURE WITH PROBE

STANDARD READING ($^{\circ}$ C)	UUC* READING ($^{\circ}$ C)	IMMERSION DEPTH (mm)	CORRECTION ($^{\circ}$ C)	UNCERTAINTY OF MEASUREMENT (\pm $^{\circ}$ C)
25.008	25.0	80	0.008	0.21
40.011	40.0	80	0.011	0.21
50.012	50.0	80	0.012	0.21

UUC : UNIT UNDER CALIBRATION

THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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

END OF CALIBRATION REPORT



Accredited
ISO/IEC 17025

CALIBRATION LABORATORY CO., LTD.

210-11, 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



ANAB
ACCREDITED
CALIBRATION AND
MAINTENANCE
ACQM 3814

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : HANNA
MODEL / TYPE : HI98191/Hi72911
SERIAL NO. : 03220019991/094406CN[LE-SVP-006]
CLID. NO. : 272400529
JOB CONTROL NO. : 240320029990
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE
CUSTOMER : GLOBAL UTILITIES SERVICES CO., LTD.

WASTEWATER TREATMENT PLANT, SUVARANBHUMAIRPORT
999 MOO 1 NHONGPROB, BANG PHI, SAMUT PRAKARN 10540

DATE OF RECEIVED : 20 March 2024

DATE OF ISSUED : 23 March 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Calibration Engineer

Approved By :

Authorized Signatory

23 March 2024

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. Q24029990

F3-011-05/12-23

page 1 of 5



F-G010 REV 03



REPORT OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : HANNA
MODEL / TYPE : HI98191/Hi72911
SERIAL NO. : 03220019991/094406CN[LE-SVP-006]
DATE OF CALIBRATION : 21 March 2024

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 [Temperature] based on ASTM E 644-04 as calibration guidelines. The calibration was performed by using Calibration Bath, Precision Thermometer and IPT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06-664-260, 11754256, Lot Number CC757348.
3. Documenting Process Calibrator , Fluke Model 744 S/N. 9226007.
4. Calibration Bath, Kambic Model OB-222 ULT S/N. 17115653.
5. Precision Thermometer, ASL Model F200-A-8 S/N. 01443303.
6. IPT, ASL Model T100-250-1D S/N. L0193A-1-1.

Certificate No. Q24029990

F3-011-05/12-23

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@cccalibration

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Lot Number. 040822, 230822. Due Date 26 April 2024.
2. The measurements are traceable to International System of Units (SI), through Control Company. Certificate No. 4281-13507707, Due Date 14 July 2024.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q23078640, Due Date 19 July 2024.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q23136342, Due Date 20 December 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 0203/67, Due Date 07 December 2024.
6. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Certificate No. TT-0136-23, Due Date 12 December 2024.

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. Q24029990

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@cccalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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 Measurement (± pH)	k Factor
4.003	4.00	140.4	+0.003	0.010	2.00
7.000	7.03	-27.5	-0.030	0.013	2.00
10.003	10.02	-189.9	-0.017	0.016	2.05

Technical Note. Setting function CAL 3 point (4.7,10).

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 4 of 67

2. pH SCALES RESULT @ 25 °C

Standard Voltage Input (mV)	pH Meter Reading		Correction (mV)	Uncertainty of Measurement (± mV)	k Factor
	(mV)	(pH)			
414.11	413.4	0.00	+0.71	0.06	2.00
118.32	117.6	5.01	+0.72	0.06	2.00
0.00	-0.7	7.01	+0.70	0.06	2.00
-177.48	-178.1	10.01	+0.62	0.06	2.00
-414.11	-414.8	14.01	+0.69	0.06	2.00

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Certificate No. Q24029990

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@cccalibration

CALIBRATION DATA

3. TEMPERATURE RESULT

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
40	25.00	25.2	-0.20	0.07
	40.01	39.9	+0.11	
	50.04	49.9	+0.14	

Note. Probe Ø 14 mm

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 012 Page 56 of 67

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

End of Certificate

Certificate No. Q24029990

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@cccalibration



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-200 °C
SERIAL NO. : N/A[LE-SVP-013]
CLID. NO. : 232401066
JOB CONTROL NO. : 240320029992
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : GLOBAL UTILITIES SERVICES CO., LTD.

WASTEWATER TREATMENT PLANT, SUVARANBHUMIAIRPORT
999 MOO 1 NHONGPROR, BANG PHILL, SAMUT PRAKARN 10540

DATE OF RECEIVED : 20 March 2024

DATE OF ISSUED : 22 March 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Calibration Engineer

Approved By :

Authorized Signatory

22 March 2024

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. Q24029992

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-200 °C
SERIAL NO. : N/A[LE-SVP-013]
DATE OF CALIBRATION : 22 March 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 10) % 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. L0193A-1-1,L1123A-1-5, PO00036374-1-10-16,PO00043543-1-10-19.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q23136342,Q23126517. Due Date 20 December 2024,20 November 2024.
2. The measurements are traceable to International System of Units (SI), through Thailand Institute of Scientific and Technological Research (TISTR) and National Institute of Metrology (Thailand). Certificate No. PSL-T 0203/67,TT-0136-23,TT-0132-23,TT-0117-23,TT-0115-23. Due Date 07 December 2024,12 December 2024,22 November 2024,30 October 2024,30 October 2024.

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:2022)"

Certificate No. Q24029992

F3-011-05/12-23

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CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION
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 ± (°C)
0.17	0.0	+0.17	0.13
104.08	104.0	+0.08	
150.17	150.0	+0.17	
180.03	180.0	+0.03	

Range : 0 °C to 200 °C

Graduation : 0.5 °C

Immersion Type : Total Immersion.

Correction of Reference Temperature (0 °C) = 0.2 °C

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 01.2 Page 56 of 67

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

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-50 °C
SERIAL NO. : N/A[LE-SVP-014]
CLID. NO. : 232401067
JOB CONTROL NO. : 240320029993
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

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

DATE OF RECEIVED : 20 March 2024

DATE OF ISSUED : 22 March 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Calibration Engineer



Approved By :

Authorized Signatory

22 March 2024

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. Q24029993

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F3-011-05/12-23

Certificate No. Q24029992

End of Certificate

page 3 of 3



CALIBRATION LABORATORY Co., LTD.
2710-11,14, 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 LABORATORY Co., LTD.
2710-11,14, 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 : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-50 °C
SERIAL NO. : N/A[LE-SVP-014]
DATE OF CALIBRATION : 22 March 2024

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-222 ULT S/N. 17115653.
2. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03 with IPRT S/N. L0193A-1-1, PO00043543-1-10-1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd. Certificate No. Q23136342, Due Date 20 December 2024.
2. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR) and National Institute of Metrology (Thailand). Certificate No. PSL-T 0203/67,TT-0136-23,TT-0114-23. Due Date 07 December 2024,12 December 2024,30 October 2024.

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:2022)"

Certificate No. Q24029993

F3-011-05/12-23

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adcalibration

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION
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)
0.002	0.00	+0.002	0.063
2.974	3.00	-0.026	
19.972	20.00	-0.028	
24.970	25.00	-0.030	

Range : $0 ^\circ\text{C}$ to $50 ^\circ\text{C}$

Graduation : $0.1 ^\circ\text{C}$

Immersion Type : Total Immersion.

Correction of Reference Temperature ($0 ^\circ\text{C}$) = $0.00 ^\circ\text{C}$

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 56 of 67

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

End of Certificate

Certificate No. Q24029993

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adcalibration



QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 23T9030
REFERENCE No : 70588-5

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : BOD INCUBATOR
MANUFACTURER : WST
MODEL : WST-BOD396L
SERIAL No : 22091421
ID No : LE-SVP-023
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 : 18-Sep-23

APPROVED BY :
ISSUED DATE : 29-Sep-23
RECEIVED DATE : 18-Sep-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.



QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 23T9030

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : BOD INCUBATOR
MANUFACTURER : WST
MODEL : WST-BOD396L
ID No : 22091421
RECEIVED DATE : 18-Sep-23
AMBIENT TEMPERATURE : 26 °C ± 1 °C
CALIBRATION DATE : 18-Sep-23
RELATIVE HUMIDITY : 54 %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.

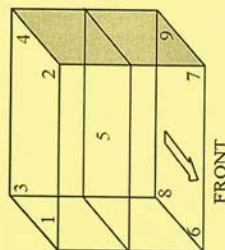
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :
1) DATA LOGGER WITH RTD HYDRA 2635A 7408027 23T6638 10-Jul-24
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE 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): 50*45*135 cm



CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.0	0.11	0.29	0.51

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	
20.0	20.0	19.87	20.15	20.04	20.04	20.10	20.20	20.21	20.17	20.15	0.25

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 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.

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www.qualitycalibration.com



CERTIFICATE No.: 23T9031
REFERENCE No.: 70588-6

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : REFRIGERATOR
MANUFACTURER : WST
MODEL : WST-396L
SERIAL No : 22091420
ID No : LE-SVP-024
CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : 
CALIBRATION DATE : 18-Sep-23

APPROVED BY : 
ISSUED DATE : 29-Sep-23
RECEIVED DATE : 18-Sep-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.

F-G010 REV : 03



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No.: 23T9031

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : REFRIGERATOR
MANUFACTURER : WST
MODEL : WST-396L
ID No : LE-SVP-024
RECEIVED DATE : 18-Sep-23
AMBIENT TEMPERATURE : 26 °C ± 1 °C
S/N : 22091420
CALIBRATION DATE : 18-Sep-23
RELATIVE HUMIDITY : 54 %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 :-

1) DATA LOGGER WITH RTD
HYDRA 2635A
MODEL : 7408027
SERIAL No : 23T6638
CERTIFICATE No : 23T6638
DUE DATE : 10-Jul-24

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

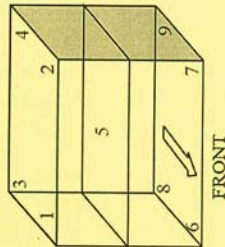
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

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 : 2
Instrument Condition : Normal
Chamber Size (W*L*H): 50*45*135 cm



CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
3.0	3.0	1.63	1.12	3.94

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	
3.0	3.0	3.54	3.62	3.24	3.05	3.04	3.15	2.89	2.93	2.42	2.0

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 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



F-G010 REV : 03

CERTIFICATE OF CALIBRATION

Certificate No : 23-075
Page : 1 of 5

Customer : GEM ENVIRONMENTAL MANAGEMENT CO.,LTD (SUVARNABHUMI)
Address : WASTEWATER TREATMENTPLANT, SUVARNABHUMIAIRPORT
999 MOO 1 NONGPRUE, BANGPHIL, SAMUTPRAKAN 10540
Instrument : UV/Vis Spectrophotometer
Manufacturer : PERSEE
Model : T8DCS
Serial Number : 31-0197-00-0024
Environment : Temperature (Before 25.8 °C , After 26.6 °C)
Humidity (Before 59.4 %RH , After 64.1 %RH)
Received Date : 29/9/2023
Calibration Date : 5/10/2023
Issue Date : 9/10/2023
Calibration Status : No Adjustment
Calibration Area : Onsite Laboratory Room

Calibrated By

Approved By

F-2401-01/26-07-60

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)	Average Measuring Value(nm)	Correction (nm)	Uncertainty ±(nm)
Certificate			
241.70	241.47	0.23	0.12
279.44	279.29	0.15	0.12
287.71	287.86	-0.14	0.12
334.02	333.96	0.06	0.12
360.89	360.91	-0.02	0.12
418.53	418.52	0.01	0.12
453.67	453.36	0.31	0.12
459.99	459.84	0.15	0.12
536.52	536.35	0.17	0.12
638.00	637.65	0.35	0.12

1.2 CRMs : Didymium Glass Filter

Traceability : Traceable to the International System of Unit through Starna Certificate 94647

Filter STDs(nm)	Average Measuring Value(nm)	Correction (nm)	Uncertainty ±(nm)
Certificate			
585.19	585.24	-0.05	0.12
684.50	684.65	-0.15	0.12
741.02	741.12	-0.10	0.12
748.56	748.63	-0.07	0.12
807.02	806.97	0.05	0.12

F-2401-01/26-07-60

2. Photometric Accuracy

Certificate No : 23-075

CRMs : Neutral Density Glass Filters

Page : 3 of 5

Traceability: Traceable to the International System of Unit through Sigma 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	N/A
0.5732	0.5710	0.0022	N/A
0.7135	0.7120	0.0015	N/A
1.0269	1.0240	0.0029	N/A

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	1.0070	0.0029	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	0.5210	-0.0001	0.0053
0.6631	0.6610	0.0021	0.0049
0.9531	0.9510	0.0021	0.0032

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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	0.5200	0.0024	0.0043
0.6997	0.6960	0.0037	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	0.7720	0.0030	0.0037
1.1171	1.1150	0.0021	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	0.5610	0.0028	0.0035
0.7644	0.7620	0.0024	0.0035
1.1014	1.0990	0.0024	0.0029

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บริษัท ทีทีเอส อีเอ็นเอช จำกัด (มหาชน)

KITISIT ENTERPRISE CO.,LTD

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

E-mail : sale@ktisel.com , www.ktsel.com



3. Photometric Accuracy

CRMs : Potassium Dichromate 60 mg/l CRM Serial Number : 35553

Traceability : Traceable to NIST through Sigma Certificate

Blank Serial Number : 105079

Spectral slit width : 1.00 nm

Certificate (Abs.)	Average Measuring Value (A)	Correct (A)	Uncertainty ±(A)
Blank	0.0000	0.0000	0.0049
235 nm	0.7454	0.0044	0.0062
Blank	0.0000	0.0000	0.0049
257 nm	0.8651	0.0041	0.0058
Blank	0.0000	0.0000	0.0049
313 nm	0.2895	0.0025	0.0052
Blank	0.0000	0.0000	0.0049
350 nm	0.6415	0.0045	0.0052

4. Stray Light (*Not Accredited)

CRMs : Potassium Iodide aqueous solution

CRM Serial Number : 35557

Traceability : Traceable to NIST through Sigma Certificate

Spectral slit width: 1.00 nm

Wavelength (nm)	Certificate	Average Measuring
260.3	>2A	2.0944
260.3	<1%T	0.80

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.

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