

ภาคผนวก ข

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



THAI HEART CALIBRATION CO., LTD.
112/1 Moo 5, Phrasa Sa, Mueang, Samut Prakan 10580
Tel. 0-2394-2142, 0-2322-8411, 0-2377-8496 Fax. 0-2327-8507



CERTIFICATE OF CALIBRATION

Certificate No.: C0-1608001/24 Page 1 of total 4 pages

Customer: WATER ANALYSIS CENTER CO., LTD.
1/94 Moo 5, T.Kanham,
A.U-thai, Ayutthaya 13210

Equipment: pH Meter
Manufacturer: METTLER TOLEDO Model: SevenCompact S220
Serial No.: B327527211 ID No.: WW1.0068
Description: Range : 0 - 14 pH, Resolution : 0.01 pH

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

Calibration Location: Jayhawk Laboratory (CL&GL)

Received Date: 16 August 2024

Calibration Date: 16 August 2024

Date of Issue: 19 August 2024

Condition of Artifacts: Used conditions but can be calibrated

Checked by:

Act as Technical Manager

Approved by:

Representative of Managing Director

() (Krisyosi K.) () (Sakda Y.)
() (Patiphan K.) () (Onnapa P.)
() (Pongsak H.) () (Nitiphong K.)
() (Kanung C.) () (Nonthachai K.)
() (Pramong P.) () (Noppol P.)

(Dr. Ekachai Putitwong)

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FE-149 REV.02 02/24/21



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Certificate No.: C0-1608001/24 Page 3 of total 4 pages

Measurement Results (Cont.):

2. Calibration of pH Electrode (Serial No.: 3222623)

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	4.01	186.1	0.013
7.01	7.01	9.3	0.013
10.01	10.00	-164.5	0.013

Note : Adjust Curve to Buffer Solution pH (4,7,10)
Temperature stability of micro bath : 25 ± 0.2 °C

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

Calibrated by: Athipat
REV.02 02/24/21



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Certificate No.: C0-1608001/24 Page 2 of total 4 pages

Reference Method:

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

Reference Standard:

Type	pH Value	Lot No.	Due Date	Traceability
pH Standard Solution	4.01	150823	Feb. 9, 2025	NIMT
	7.01	180723	Jan. 12, 2025	
	10.01	160823	Jan. 16, 2025	

Type	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	2630521	10-2312001/23	Dec. 24, 2024	THC
Digital Thermometer with Sensor	1709138 / 4605984-005	10-0806001/24	Jun. 7, 2025	

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:
- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

1. Function Simulated pH Meter

Standard Applied (mV)	Nominal Value (pH)	UUC Reading		Uncertainty (± mV)
		pH	mV	
177.48	4.00	4.01	177.3	0.060
0.00	7.00	7.00	-0.1	0.060
-177.48	10.00	10.01	-177.4	0.060

UUC : Unit Under Calibration

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

Calibrated by: Athipat
REV.02 02/24/21



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Certificate No.: C0-1608001/24 Page 4 of total 4 pages

Reference Method:

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

Reference Standard Instruments:

Type	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	B7C853	10-0911001/23	Nov. 8, 2024	THC
Platinum Resistance Thermometer	4854	C0A30047	Oct. 22, 2025	FLUKE
Liquid Bath	XO111019	10-2405001/23	May 25, 2025	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:
- THC, Thai Heart Calibration Co., Ltd.
- FLUKE, Fluke Corporation, U.S.A.

Measurement Results:

(X) Without Adjustment

Dimension of probe : Diameter 4 mm. Sensor Type : RTD (PT100)				
Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
120	22.00	22.2	-0.20	0.065
120	25.00	25.2	-0.20	0.065
120	28.00	28.2	-0.20	0.065

UUC : Unit Under Calibration

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

- End of Certificate -

Calibrated by: Pongsak
REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.
112/1 Moo 5, Phrasa Sa, Mueang, Samut Prakan 10280
Tel. 0-2734 3142, 0-2734 4411, 0-2734 8966 Fax. 0-2737 4307



CERTIFICATE OF CALIBRATION

Certificate No.: C0-1607004/24 Page 1 of total 2 pages

Customer: WATER ANALYSIS CENTER CO., LTD.
1/94 Moo 5, T.Kanham,
A.U-thai, Ayutthaya 13210

Equipment: Conductivity Meter
Manufacturer: EUTECH Model: CON 2700
Serial No.: 2657889 ID No.: WWI. 0136
Description: -

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

Calibration Location: Jayhawks Laboratory (CI.&GI.)

Received Date: 16 July 2024

Calibration Date: 18 July 2024

Date of Issue: 18 July 2024

Condition of Artifacts: Used conditions but can be calibrated

Checked by:

Act as Technical Manager

Approved by:

Representative of Managing Director

() (Krisyosol K.) () (Sakda Y.)
() (Patiphan K.) (✓) (Onnapa P.)
() (Pongsak H.) () (Nitiphong K.)
() (Kanung C.) () (Nontachai K.)
() (Pramong P.) () (Noppol P.)

(Dr. Ekachai Puttiwong)

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FE-169

REV.02 02/24/21



Master Calibration Co.,Ltd.

547 Soi Ratchadulavit, Kwang Sametnakh, Khet Huaykwang, Bangkok 10310
Tel. : (02) 274 2978-9, (02) 2742987-8 Fax : (02) 274 2518, (02) 274 2989
Website : www.mastercalibration.com E-mail : calibration@mastercalibration.com

Certificate of Calibration

TEMPERATURE
CONTROLLER ENCLOSURES



Page 1 of 3

Certificate No.: MC 2407449

Customer: Water Analysis Center Co., Ltd.
1/94 Moo 5, T.Kanham, A.U-Thai, Ayutthaya 13210.

Reference Job No.: 24-1546 Received Date: 9 July 2024
Description: Refrigerator Resolution: 0.1 °C
Manufacturer: SANDEN INTERCOOL Model: SEC-1500SBD
Serial No.: SEC1500201A-0708-00304 ID. No.: WWI.0038
Marking: Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2407449) has been attached to the case.
Method: In-house calibration procedure MWI-T-033 this method Base on TLAS G-20-1/02-08 "Temperature Controlled Enclosures".
Location of Calibration: Water Analysis Center Co., Ltd.; Laboratory.
Environmental Conditions: Ambient Temperature: (25.2 to 25.4) °C
Relative Humidity: (62.1 to 63.3) %
Date of Calibration: 9 July 2024 Date of Issue: 10 July 2024

Checked by:

Chalemit Rakphada
(Calibration Engineer)

Approved by:

Aittipong Kanjanasri
(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.

[MCP-Q-077 ; Rev.6 ; Date : 22/04/2021]

ภาคผนวก ข-2



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Tel. 0-2734 3142, 0-2734 4411, 0-2734 8966 Fax. 0-2737 4307



Certificate No.: C0-1607004/24

Page 2 of total 2 pages

Reference Method:

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

Reference Standard :

Material	Batch Value	Lot Number	Due Date	Traceability
Conductivity Standard Solution	147.1 µS/cm 1.423 mS/cm	S230330005 S231129006	Nov. 9, 2024 May 13, 2025	SCP Science SCP Science

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

- SCP Science.

Measurement Results: (Probe Serial No. : 93X219065)

Conductivity Standard Solution	Measured Value	Correction	Uncertainty (±)
147.1 µS/cm	149.0 µS/cm	-1.9 µS/cm	2.5 µS/cm
1.423 mS/cm	1.425 mS/cm	-0.002 mS/cm	0.0052 mS/cm

Note: Adjustment points: 147.1µS/cm 1.423mS/cm

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

- End of Certificate -

Calibrated by:

Athipat

REV.02 02/24/21

FE-169



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Tel. : (02) 274 2978-9, (02) 2742987-8 Fax : (02) 274 2518, (02) 274 2989
Website : www.mastercalibration.com E-mail : calibration@mastercalibration.com

Certificate No.: MC 2407449

Page 2 of 3

Reference Standard Instrument :

Description: Data Acquisition/Switch Unit Certificate No.: MC 2309074 Serial No.: MY-44012056 Due date: 7 Aug 2024 Traceable thru: MCAL
With Thermocouple Type " T " ID. No.1471 to 1479

Traceability :

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

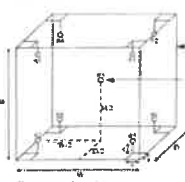
1. Calibration Procedure:

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 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.

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 minimum measured temperatures throughout observation.



Overall Ambient Temperature around the Chamber variation : 4.2 °C

Overall Line Voltage variation : 0.1 V

Chamber Size (W*H*D): 171 cm x 157 cm x 60 cm

Checked by: Chalemit Rakphada

[MCP-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2407449

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	
3.0	4.2	4.0	4.0	4.0	4.0	3.7	3.8	3.5	3.5	1.0

Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
4.0	3.0	3.0	0.8	0.9	2.1

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.0$, providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by: Chalermkrit

[MCP-Q-077, Rev.5, Date: 22/04/2021]



AUTOMATION SERVICE CO.,LTD.
CALIBRATION LABORATORY

Instrument : DO Meter
Model : DO-31P
Serial No. : 780065

Cert. No. WAC-065
Page 2 of 2

Calibrate Procedure

- ☐ This instrument was calibrated by comparison with standard solution (PH/ORP)
- ☐ This instrument was calibrated by comparison with scattering plate value (Turbidity)
- ☐ This instrument was calibrated by comparison with conductivity (Conductivity)
- ☒ This instrument was calibrated by comparison with Sodium sulfite anhydrous (DO)

Condition of this result of calibration

1). Reference Standard Solution

Standard	Lot No	Batch	Cert. No.	Due Date
Sodium Sulfite Power	408K1405	-	-	-

2). Traceability This certification is traceable to

- ☒ Kanto Chemical Co.,INC.
- ☐ DKK Corporation

Result Of Calibration

Standard Solution (mg/l) at 25.7°C	Before Adjust		After Adjust	
	Indicator	Error	Indicator	Error
Zero	0.00	+ 0.10	0.00	-
Span	8.02	- 1.57	8.02	-

DO Electrode No. OE270AA(5) S/N 111F0029

Calibrated By

P. Yooyen

(Ms. Phance Yooyen)
Technician



AUTOMATION SERVICE CO.,LTD.
CALIBRATION LABORATORY

SV 201005/2024

Cert. No. WAC-065
Page 1 of 2

CERTIFICATE OF CALIBRATION

Instrument : DO Meter
Model : DO-31P
Serial No. : 780065
Manufacturer : TOA-DKK
Measuring Range : 0.00 ~ 20.00 mg/l

Machiae : -
Location : -

Customer : Water Analysis Center Co.,Ltd.
1/94 Moo.5 T.Kanham, A.U.-Thai
Ayuthaya 13210 Thailand

Date Of Received : 11 / 01 / 2024
Date Of Calibration : 11 / 01 / 2024

Ambient Condition : Temperature 26 °C
Humidity 58 % RH

Calibrated By :

P. Yooyen

(Ms. Phance Yooyen)
Technician

Approved By :

N. Nipon

(Mr. Nipon Phangsomrak)
Technical Manager

Date Of Issue : 15 / 01 / 2024

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Automation Service Co., Ltd. 929/929/1 Soi Pathanakit/20, Pathanakit Rd., Suanluang, Suanluang, Bangkok 10250
Tel : 02-219 9994 ext. 721,722 / E-mail : info@automation.co.th, service@automation.co.th / www.automation.co.th



AUTOMATION SERVICE CO.,LTD.
CALIBRATION LABORATORY



Intech Metrological Center Co.Ltd.
38/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Salmi, Bangkok 10220, Thailand
Tel. (662) 909-8820 (Auto 10 lines) www.imc-instrument.com



Certificate of Calibration

Certificate No. : MT24-3208
Page : 1 of 2

Customer : Water Analysis Center Co.,Ltd.
Address : 1/94 M.5, Rojana Industrial Park, T.Kanham, A.U.-Thai, Ayuthaya 13210

Description : Hot Air Oven	Order No. : 1152/24
Manufacturer : Memmert	Received date : Mar 22, 2024
Model : UF 280	Calibration date : Mar 22, 2024
Serial No. : B620.0814	Environment Condition :
Identification No. : WWL 0212	Temperature : (25±1.0) °C
Calibration Place : Customer Laboratory	Humidity : (50±30) %RH

Calibration Method : Calibration were conducted using in-house calibration procedure GP-MT-005 According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on Euramet Calibration Guide No.20 - guidelines on the Calibration of Temperature and/or Humidity Controlled Enclosures.

Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49020096	MT23-7163	Nov 30, 2024

The effect that the result relate only to the items calibrated. It was found accurate as shown on date and place of calibration only.

Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand (NIMT)

The reported expanded uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$, providing a level of confidence of not less than 95%

Calibrated by : Mr.Yuttakom Jamnansri

Approved by :

(Mr. Panuwat Phukian)

Issue date : Apr 10, 2024

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Rev.03 / Feb 2024

FM-MT-013



Intech Metrological Center Co., Ltd.
39/1 Soi 82, Sukhaphan 5 Rd., O ngoen,
Salmal, Bangkok 10220, Thailand
Tel. (662) 909-8820 (Auto 10 lines) www.imc-instrument.com



Certificate No. : MT24-3208

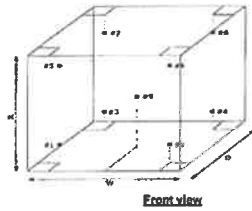
Page : 2 of 2

Function : Temperature measurement
Calibration point : 104, 180 °C

Result : Without adjustment
Resolution : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (± °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
104	103.494	103.933	103.871	103.988	103.990	104.061	103.843	104.217	104.022	0.45
180	179.985	179.853	180.047	179.983	179.938	180.088	180.065	180.273	180.105	0.54

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (± °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.34	0.86	1.3
180.0	180.0	0.41	0.86	1.2



#1 Lower Left Front
#2 Lower Right Front
#3 Lower Left Rear
#4 Lower Right Rear
#5 Upper Left Front
#6 Upper Right Front
#7 Upper Left Rear
#8 Upper Right Rear
#9 Geometric Center

Front view

UUC* = Unit under calibration

Uniformity = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.

Overall Variation = Difference of temperature value between the maximum and minimum any time.

Stability = One half of the maximum difference of measured temperatures at any one probe.

Rev.03 / Feb 2024

©Dp

FM-MT-013



Certificate No.: C01241754

Page: 2 of 2

Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value	Reference Points (g)				
	A	B	C	D	E
100 (g)	0.0000	0.0001	0.0000	0.0002	0.0002

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00006

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.00001	1.0000	0.0000	0.00011	2.04
2	2.00002	2.0000	0.0000	0.00011	2.04
5	5.00002	5.0000	0.0000	0.00011	2.04
10	10.00001	10.0000	0.0000	0.00011	2.04
20	20.00001	20.0000	0.0000	0.00012	2.03
50	50.00003	50.0000	0.0000	0.00013	2.02
70	70.00004	70.0000	0.0000	0.00015	2.01
100	99.99996	100.0001	0.0001	0.00017	2.01
120	119.99987	120.0002	0.0002	0.00021	2.00
150	149.99989	150.0002	0.0002	0.00024	2.00
200	199.99996	200.0004	0.0004	0.00030	2.00

The End of Certificate

คำอธิบายเพิ่มเติม
39/1 Sukhaphan 5 Rd., O ngoen, Salmal, Bangkok 10220
Tel. (662) 909-8820 (Auto 10 lines) www.imc-instrument.com

Delivering Growth - In Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



Certificate of Calibration

Equipment: Balance
Model: BL 210S
Serial No. (or ID.): 15808131 (WWL 0022)
Manufacturer: Senorius
Condition: In condition

Certificate No.: C01241754
Issued Date: 05 June 2024
Job No.: WO-00030302
Page: 1 of 2

Customer: Water Analysis Center Co., Ltd.
1/94 Moo 5, Rojana Industrial Park, Rojana Road,
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Environment Condition: Temperature 26 °C ± 0.2 °C
Humidity 50 %RH ± 2.6 %RH

Calibration Place: Water Analysis Center Co., Ltd. (น้ำอหะระ)
1/94 Moo 5, Rojana Industrial Park, Rojana Road,
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Calibration By: Mr. Polawad Ruamrup
Calibration Date: 05 June 2024
The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02240400

(Mr. Polawad Ruamrup)
Person in charge

(Mr. Rungrat Jenkitrakulchai)
Authorized signatory

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 assessment 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.

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Delivering Growth - In Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



MEGAFIL CO., LTD.

99/183 Moo 3 Tambon Bang Rak Noi Amphur Muang Nonthaburi 11000
Tel. 0-2528-6081-2 Fax. 0-2528-6083, 0-2525-7034
www.megafil.co.th E-mail: megafilgroup@gmail.com

BSC Certification Test Report

Page 1 of 6

Certificate No. : M1439/24

Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED

Customer Address : 1/94 Moo 5 Khan Ham Subdistrict,
Uthai District, Phra Nakhon Si Ayutthaya 13210

Equipment : Biological Safety Cabinet Class II Type A2

Manufacturer : Microtech

Model : V6-T

Serial No : 0972k097272

ID No. : WWL 0084

Were in accordance with ☒ EN 12469 ☐ NSF 49 ☐ Manufacturer's specification

Test Date : 15/10/2024

Due Date : 15/10/2025 or after HEPA filters are replaced or unit is moved

Test by : Mr. Pawut Wongnarekornkul

Approved by :

(Mr. Kridsada Thinhutoci)
Authorized Signatory

Issued Date : 16/10/2024

This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).

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Megafil Co., Ltd.

MG-FM-7.8-001, R00 (01/07/19)

Certificate No. : M1439/24

Procedure Used :
: European Standard EN12469 : 2000 has the status of British Standard,
Biotechnology Performance criteria for microbiological safety cabinets.
: NSF International Standard / American National Standard NSF / ANSI 49-2008
Biosafety Cabinet : Design, Construction, Performance and Field Certification.
: Australian Standard : AS 1807.23-2000 Determination of intensity of radiation
from germicidal ultraviolet lamps.
: Manufacturer's specification.

1. Downflow velocity test.

Measurement Information

No. of Rows	No. of Readings	Grid Spacing Front-Back	Grid Spacing Side-Side	Probe height Above sash
2	8	1/4, 3/4	1/8, 3/8	100mm

Measurement Data. (m/s.)

0.37	0.43	0.41	0.39
0.36	0.35	0.32	0.34

Average velocity 0.37 m/s (73 FPM.) Velocity range 0.25-0.50 m/s (49-98 FPM.)

Uniformity(EN: +/-20%avg.) 0.30 - 0.44 m/s (58 - 88 FPM.)

Supply filter dimension 24 x 72 (inch x inch) Supply filter area 10.69 SQ.FT

Downflow volume (Q) 790 CFM.

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer Model 425 S/N : 02968605 Calibration date : 10/05/2024

Certificate No. : M1439/24

2. Inflow velocity test.

Select method. : ☐ DIM ☒ Exhaust velocity. ☐ MFG's Specifications

MGF's Specifications method

0.54	0.37	0.55	0.54	0.55
0.56	0.55	0.56	0.57	0.54
0.59	0.53	0.54	0.57	0.56
0.53	0.6	0.56	0.55	0.58
0.55	0.58	0.54	0.53	0.55

(m/s.)

Average Inflow velocity 0.47 m/s (93 FPM.) Velocity range 0.40 m/s (79 FPM.)

Inflow dimension 8 x 72 (inch x inch) Inflow area 4.00 SQ.FT

Inflow volume(Q) 372 CFM

Result Summary ☒ Pass ☐ Fail

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 02968605 Calibration date : 10/05/2024

3. HEPA filter leak test.

Measurement Data

HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	18 µg/l	<0.01%	<0.01%
Exhaust HEPA Filter	18 µg/l	<0.01%	<0.01%

Certificate No. : M1439/24

Leak location

Supply HEPA Filter
Back

Exhaust HEPA Filter
Back



Result Summary ☒ Pass ☐ Fail

Equipment used : Aerosol Photometer Model TDA-2H S/N : 20138 Calibration date : 08/05/2024

Equipment used : Smoke Generator Model TDA-6C S/N : 20192

4. Airflow smoke patterns test

Measurement Information

- Downflow Pattern test : Smoke shall be passed from one end of the cabinet to the other, along the centerline of the work surface, at a height of 4 inch (10 cm) above the top of the access opening
- View screen retention test : Smoke shall be passed from one end of the cabinet to the other, 1.0 in (2.5 cm) behind the view screen, at a height 6.0 inch (15 cm) above the top of the access opening.
- Work opening edge retention test : Smoke shall be passed along the entire perimeter of the work opening. Particular attention should be paid to corners and vertical edges.
- Sash/window seal test : Smoke shall be passed up the inside of the window 2 in (5 cm) from the sides and along the top of the work area.

Certificate No. : M1439/24

Result Summary

Downflow Pattern test ☒ Accept ☐ Non-Conforming
View screen retention test ☒ Accept ☐ Non-Conforming
Work opening edge retention test ☒ Accept ☐ Non-Conforming
Sash/window seal test ☒ Accept ☐ Non-Conforming

5. Site installation

Sash Alarm. ☐ Pass ☐ Fail ☒ N/A
Interlock System. ☐ Pass ☐ Fail ☒ N/A
Exhaust System Performance ☐ Pass ☐ Fail ☒ N/A

Remark / Recommendation

ระบุ Site installation ไม่มีการตรวจสอบ เนื่องจากตู้ไม่มีฟังก์ชันนี้

6. Illumination Test (Lighting) : Option

Lighting should be adequate for safe working within the cabinet. Illumination measured at the work surface.

Lux

585	936	917	514
849	1400	1465	755

Equipment used : Digital Light Meter Model Easy View 31 S/N : 160404993 Calibration date : 08/05/2024

Remark :

Certificate No. : M1439/24

7. Ultraviolet Lamp Test (UV) : Option

Ultraviolet radiation where UV Lamp are fitted, the intensity of radiation at a wavelength of 254 nm.
Shall be not less than 400 mW/m² when measures at work floor surface.

mW/m²

630	1450	1480	690
380	920	930	390

Equipment used : UVC LIGHT METER Model : UVC-234SD S/N : Q879819 Calibration date : 08/05/2024

Remark :

-000-

Megafil Co., Ltd.

MCQ-FM-7.8-001, R00 (01/07/19)

Certificate No.: MC 2314268

Page 2 of 3

Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit	MC 2301270	MY44020009	9 Mar 2024	MCAL

With Thermocouple Type "T" ID. No.27/1 to 27/5

Traceability :

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

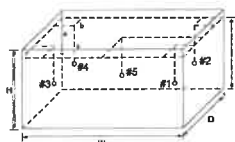
1. Calibration Procedure:

This Instrument was calibration according to ASTM E715 - 2007 by comparison with calibrated sensor under no load condition. The sensor were placed on five points and located one sensor 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 five sensor 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 minimum measured temperatures throughout observation.



- Overall Ambient Temperature around the Chamber variation : 1.3 °C
- Overall Line Voltage variation : 0.0 V
- Chamber Size (W*H*D) : 50 cm x 12 cm x 30 cm
- Water Level : 7 cm

Checked by : Chalermit

[MCQ-Q-077 ; Rev.6 ; Date : 22/04/2021]

ภาพผนวก ข-6

Certificate of Calibration

LIQUID BATH



Page 1 of 3



Certificate No.: MC 2314268

Customer : Water Analysis Center Co., Ltd.
1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210.

Reference Job No. : 23-2833 Received Date : 15 December 2023

Description : Water Bath

Manufacturer : ESSTELL Model : EWB-122D

Serial No. : 20180508122 ID. No. : WWL 0214

Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2314268) has been attached to the case.

Method : In-House calibration procedure MWI-T-029 this method is reference to ASTM E715 "Liquid Bath".

Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.

Environmental Condition : Ambient Temperature : (29.4 to 29.8) °C

Relative Humidity : (49.0 to 52.0) %

Date of Calibration : 15 December 2023 Date of Issue : 19 December 2023

Checked by : Chalermit Rakphada
(Calibration Engineer)

Approved by : Aittipong Kanyana
(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.

[MCQ-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314268

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	Ref. #5	
45.0	44.5	44.4	44.5	44.5	44.6	0.45

Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.5	45.0	45.0	0.62	0.88	1.5

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.0$, providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by : Chalermit

[MCQ-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate of Calibration

TEMPERATURE CONTROLLER ENCLOSURES



Certificate No.: MC 2314270

Page 1 of 3



Customer : Water Analysis Center Co., Ltd.
1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210.

Reference Job No. : 23-2833 Received Date : 15 December 2023
Description : Incubator
Manufacturer : Memmert Model : IN260
Serial No. : D619.0170 ID. No. : WWL 0192
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2314270) 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 : Water Analysis Center Co., Ltd. ; Laboratory.
Environmental Conditions : Ambient Temperature : (25.2 to 25.6) °C
Relative Humidity : (65.4 to 66.2) %
Date of Calibration : 15 December 2023 Date of Issue : 19 December 2023

Checked by : Chalermkit
Chalermkit Rakphada
(Calibration Engineer)

Approved by : Aittipong
Aittipong Kanjanasit
(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.

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314270

Page 2 of 3

Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit	MC 2214032	MY41029992	26 Dec 2023	MCAL

With Thermocouple Type " T " ID. No.31/1 to 31/9

Traceability :

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

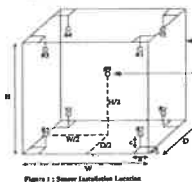
1. Calibration Procedure:

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 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.

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 minimum measured temperatures throughout observation.



Overall Ambient Temperature around the Chamber variation : 0.4 °C

Overall Line Voltage variation : 0.0 V

Chamber Size (W*H*D) : 65 cm x 80 cm x 50 cm

Checked by : Chalermkit

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314270

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	
35.0	35.2	35.2	35.2	35.2	35.1	35.1	35.0	35.1	35.1	0.44

Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	0.13	0.21	0.4

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 : Chalermkit

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate of Calibration

AUTOClave



Certificate No.: MC 2314269

Page 1 of 3



Customer : Water Analysis Center Co., Ltd.
1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210.

Reference Job No. : 23-2833 Received Date : 15 December 2023
Description : Autoclave
Manufacturer : TOMY Model : Autoclave ES-315
Serial No. : S1135128 ID. No. : WWL 0083
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2314269) has been attached to the case.
Method : In-House calibration procedure MWI-T-036 this method is reference to based on BS 2646 : 1993 Part 5 "Autoclave".
Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.
Environmental Condition : Ambient Temperature : (29.4 to 30.7) °C
Relative Humidity : (50.0 to 52.0) %
Date of Calibration : 15 December 2023 Date of Issue : 19 December 2023

Checked by : Chalermkit
Chalermkit Rakphada
(Calibration Engineer)

Approved by : Aittipong
Aittipong Kanjanasit
(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.

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314269

Page 2 of 3

Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Temperature Recorder RTD 100 Ohm	MC 23001 63	M79252	9 Jan 2024	MCAL
Temperature Recorder RTD 100 Ohm	MC 23001 64	5978194	9 Jan 2024	MCAL
Temperature Recorder RTD 100 Ohm	MC 23001 65	M79251	9 Jan 2024	MCAL

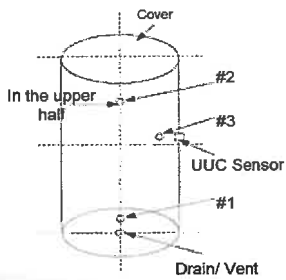
Traceability :

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

1. Calibration Procedure:

The equipment list above was calibrated an accuracy of temperature in a chamber of the sterilizer.
The calibration was performed by direct measurement of generated temperatures using the standard thermometer with three temperature sensors. The data was recorded in a period of fifteen minutes of the sterilizing status. The temperature scale used was based on ITS-90.

The calibration of sterilizer was carried out at the point indicated by following the In-house calibration method No. MWI-T-036 based on BS 2646 : 1993 : Part 5 in Tests for performance section.



- Overall Line Voltage variation : 0.0 V

Checked by : *Chalermpol*

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314269

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	
121	121.72	121.73	121.95	0.61

Characterization Result

Desired Temperature (°C)	Setting Temperature (°C)	Timer Setting (min)	Indicating Temperature (°C)	Indicating Pressure (kPa)	Measured Stability (±°C)	Measured Uniformity (°C)	Overall Variation (°C)
121	121	15.0	121	120	0.60	0.35	1.35

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

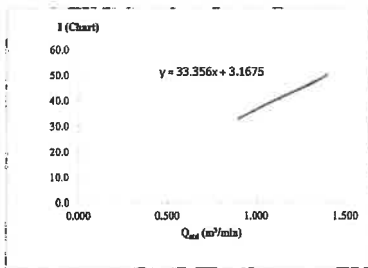
Checked by : *Chalermpol*

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

High Volume Air Sampler Calibration Worksheet

Project Site : พิธี-กรีน คอนโดมิเนียม Page 1 of 1
Location : ภายในพื้นที่โครงการ
Date of measurement : 17/5/2024
Worksheet No. : C-170524-WWL0223 Calibration Office
High Volume ID : WWL0223 Calibrator ID : WWL0103
High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028A
High Volume S/N : 2738 Calibrator S/N : 3271
Ambient Condition : 27/03/2024
Temperature (°C) : 26 Quality Standard Slope : 1.59186
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01922

Test No.	delta H ₂ O (inch)	Q _{del} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.397	50.0	49.80	Slope : 33.22 Intercept : 3.155 Correlation Coefficient : 0.9995
2	4.40	1.324	47.0	46.81	
3	3.20	1.131	41.0	40.83	
4	2.40	0.981	36.0	35.85	
5	2.00	0.897	33.0	32.87	



Calibrated by : [Signature]
Mr. JITTAWEE WONGMAKHIEB

Approved by : [Signature]
Mr. RUNGSASIKORN KOSUM

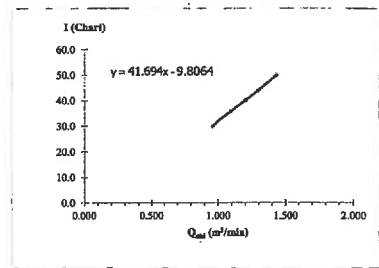
POLAB 15-1/25

แก้ไขครั้งที่ : 1 วันที่แก้ไข : 1 ธ.ค. 2560 หน้า : 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Project Site : พิธี-กรีน คอนโดมิเนียม Page 1 of 1
Location : ภายในพื้นที่โครงการ
Date of measurement : 17/5/2024
Worksheet No. : C-170524-WWL0224 Calibration Office
High Volume ID : WWL0224 Calibrator ID : WWL0103
High Volume Model : TE-6070 (PM10) Calibrator Model : TE-5028A
High Volume S/N : 2739 Calibrator S/N : 3271
Ambient Condition : 27/03/2024
Temperature (°C) : 26 Quality Standard Slope : 0.99709
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01922

Test No.	delta H ₂ O (inch)	Q _{del} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.429	50.0	31.44	Slope : 25.22 Intercept : -6.167 Correlation Coefficient : 0.9996
2	4.10	1.295	44.0	27.67	
3	3.50	1.199	40.0	25.15	
4	2.90	1.093	36.0	22.64	
5	2.20	0.955	30.0	18.87	



Calibrated by : [Signature]
Mr. JITTAWEE WONGMAKHIEB

Approved by : [Signature]
Mr. RUNGSASIKORN KOSUM

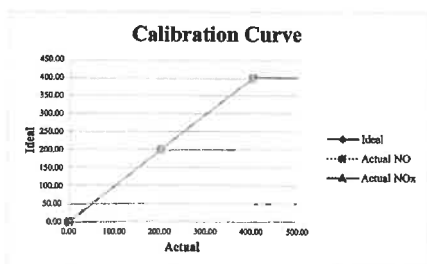
POLAB 15-1/25

แก้ไขครั้งที่ : 1 วันที่แก้ไข : 1 ธ.ค. 2560 หน้า : 1 ของ 1

Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : พิธี-กรีน คอนโดมิเนียม
Location : ภายในพื้นที่โครงการ
Date of measurement : 17 May 2024
Worksheet No. : C-170524-WWL 0022
Ambient NO_x Analyzer ID : WWL 0022
Manufacturer : Thermo Environmental Instruments Inc
Ambient NO_x Analyzer Model : 43C
Ambient NO_x Analyzer S/N : 42C-70988-367
Multi Gas Calibrator
Calibrator ID : WWL0124
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 08 March 2024
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2025
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO _x	Error NO _x	%Error NO _x
ZERO	0.00	0.10	0.10	-	0.10	0.10	-
SPAN 200 ppb	200.00	200.10	0.10	0.05	200.20	0.20	0.10
SPAN 400 ppb	400.00	400.10	0.10	0.03	400.10	0.10	0.03
AVERAGE (%)				0.04			0.06



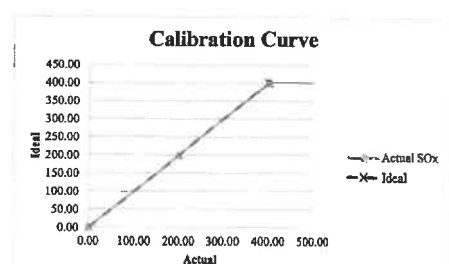
Calibrated by : [Signature]
(MISS SUTHIDA SINGHAPHEN)
Chemist

Approved by : [Signature]
(Mr. RUNGSASIKORN KOSUM)
Technical Management

Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : พิธี-กรีน คอนโดมิเนียม
Location : ภายในพื้นที่โครงการ
Date of measurement : 17 May 2024
Worksheet No. : C-170524-WWL 0021
Ambient SO_x Analyzer ID : WWL 0021
Manufacturer : Thermo Environmental Instruments Inc
Ambient SO_x Analyzer Model : 43C
Ambient SO_x Analyzer S/N : 43C-58282-317
Multi Gas Calibrator
Calibrator ID : WWL0124
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 08 March 2024
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 49.68
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2025
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO _x	Error Sox	%Error Sox
ZERO	0.00	0.10	0.10	-
SPAN 200 ppb	200.00	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.10	0.10	0.03
AVERAGE (%)				0.04



Calibrated by : [Signature]
(MISS SUTHIDA SINGHAPHEN)
Chemist

Approved by : [Signature]
(Mr. RUNGSASIKORN KOSUM)
Technical Management

