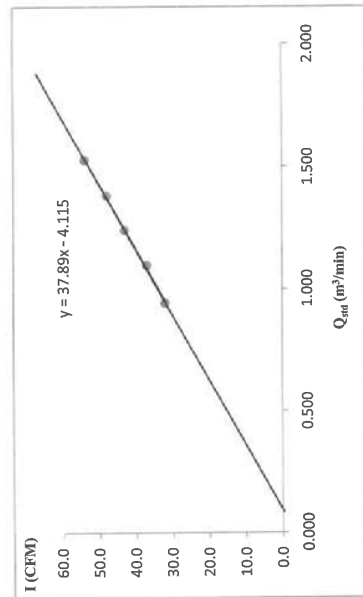

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

High Volume Air Sampler Calibration Worksheet

Project Site : บริษัทเกษตรฯ รุด ในถ้ำ ร้อยที่ 2
Location : ภาชีพื้นที่โครงการ
Date of measurement : 02/12/20
Worksheet No. : C-021220-WWL0096 Calibration Office : WWL0103
High Volume ID : WWL0096 Calibrator ID : TE-5028A
High Volume Model : TE-5170 (TSP) Calibrator Model : 3271
High Volume S/N : 2730 Calibrator S/N : 29/01/2020
Ambient Condition :
Temperature (°C) : 27 Quality Standard Slope : 1.61297
Barometric Pressure (mmHg) : 757 Quality Standard Intercept : -0.04609

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	2.20	0.944	32.0	31.87	Slope : 37.89
2	3.00	1.098	37.0	36.84	Intercept : -4.115
3	3.85	1.240	43.0	42.82	Correlation Coefficient : 0.9992
4	4.80	1.381	48.0	47.80	
5	5.90	1.528	54.0	53.77	

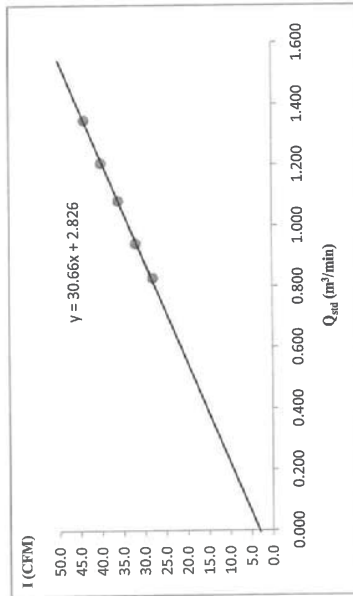


Calibrated by : (MR.PHANUDITH PETCHAUTI) Chemist
Approved by : (MR.RUNGRASAKORN KOSIM) Technical Management

High Volume Air Sampler Calibration Worksheet

Project Site : บริษัทเกษตรฯ รุด ในถ้ำ ร้อยที่ 2
Location : ภาชีพื้นที่โครงการ
Date of measurement : 02/12/20
Worksheet No. : C-021220-WWL0101 Calibration Office : WWL0103
High Volume ID : WWL0101 Calibrator ID : TE-5028A
High Volume Model : TE-6070 (PM-10) Calibrator Model : 3271
High Volume S/N : 2733 Calibrator S/N : 29/01/2020
Ambient Condition :
Temperature (°C) : 27 Quality Standard Slope : 1.01001
Barometric Pressure (mmHg) : 757 Quality Standard Intercept : -0.02888

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	1.70	0.829	28.0	17.61	Slope : 30.66
2	2.20	0.943	32.0	20.12	Intercept : 2.826
3	2.90	1.083	36.0	22.64	Correlation Coefficient : 0.9994
4	3.60	1.206	40.0	25.15	SSP : 37.47
5	4.50	1.349	44.0	27.67	



Calibrated by : (MR.PHANUDITH PETCHAUTI) Chemist
Approved by : (MR.RUNGRASAKORN KOSIM) Technical Management



Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : โครงการ โน้ดรีวอลท์ รัชดา 2

Location : ภายในพื้นที่โครงการ

Date of measurement : 02 December 2020

Worksheet No. : C-010620-WWL 0117

Ambient NOx Analyzer ID : WWL 0117

Manufacturer : HORIBA

Ambient NOx Analyzer Model : APNA-370

Ambient NOx Analyzer S/N : VKLYC3K0

Multi Gas Calibrator

Calibrator ID : WWL0128

Calibrator Model : Series 6100

Calibrator S/N : S/N 7462

Calibrate Date : 20 June 2020

Cylinder Std. Gas

Std. Gas Concentration (PPM) : 50.90

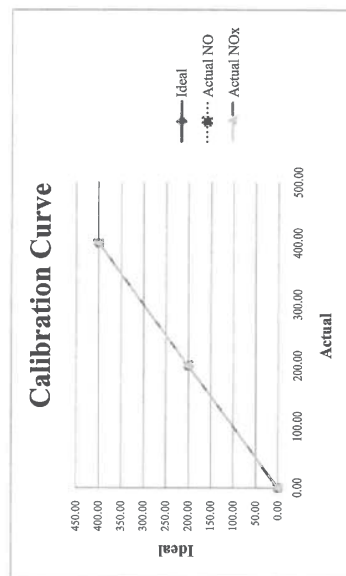
Cylinder Pressure (psi) : 2000

Certified Date : 07 December 2017

Expired Date : 07 December 2021

Serial No. : CC241587

Point	CALIBRATION RESULTS				
	Ideal	Actual NO	%Error NO	Actual NOx	Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10
SPAN 200 ppb	200.00	200.20	0.10	200.20	0.20
SPAN 400 ppb	400.00	400.10	0.10	400.20	0.20
AVERAGE (%)					0.06
					0.07



Calibrated by

(MR. JATUMET INTARA-OPAS)

Chemist

Approved by

(MR. RUNGSAKORN KOSUM)

Technical Management

Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : โครงการ โน้ดรีวอลท์ รัชดา 2

Location : ภายในพื้นที่โครงการ

Date of measurement : 02 December 2020

Worksheet No. : C-010620-WWL 0112

Ambient SOx Analyzer ID : WWL 0112

Manufacturer : HORIBA

Ambient SOx Analyzer Model : APSA-370

Ambient SOx Analyzer S/N : 8R18BBF

Multi Gas Calibrator

Calibrator ID : WWL0128

Calibrator Model : Series 6100

Calibrator S/N : S/N 7462

Calibrate Date : 20 June 2020

Cylinder Std. Gas

Std. Gas Concentration (PPM) : 49.68

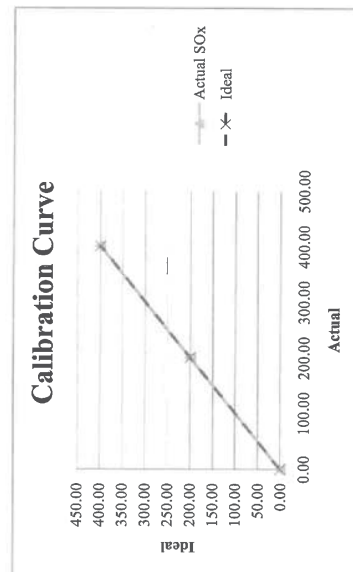
Cylinder Pressure (psi) : 2000

Certified Date : 07 December 2017

Expired Date : 07 December 2021

Serial No. : CC241587

Point	CALIBRATION RESULTS				
	Ideal	Actual SOx	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

(MR. JATUMET INTARA-OPAS)

Chemist

Approved by

(MR. RUNGSAKORN KOSUM)

Technical Management



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการสอบเทียบและใบเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

วันที่ : 11 กุมภาพันธ์ 2563

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 5097



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการสอบเทียบและใบเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

วันที่ : 11 กุมภาพันธ์ 2563

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 5097

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : บริษัท ศูนย์วิเคราะห์น้ำ จำกัด

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 5097

CYLINDER NO : CA485062

STANDARD GAS CONCENTRATION (PPM) : 4500.00

CERTIFIED DATE : Mar 28, 2017

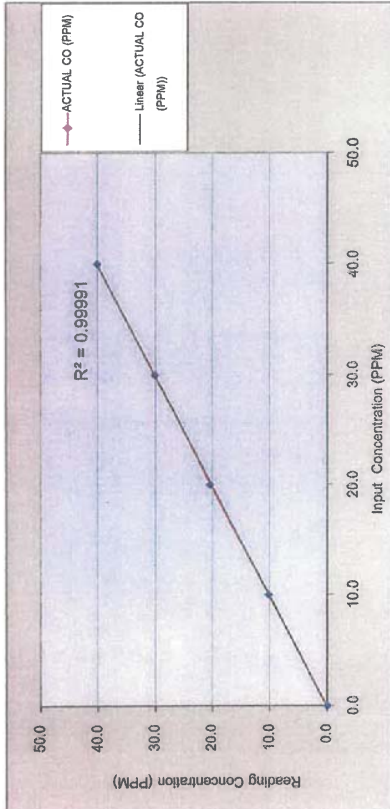
CYLINDER PRESSURE (psig) : 2015

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 28, 2020

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS		
	IDEAL (PPM)	ACTUAL CO (PPM)	% ERROR CO
ZERO	0.00	0.00	-
1	10.00	10.20	2.00
2	20.00	20.40	2.00
3	30.00	30.10	0.33
4	40.00	40.10	0.25
AVERAGE (%)			1.15



CALIBRATED BY : คุณพรชัย ภาคินวรักษ์

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณพรชัย ภาคินวรักษ์ โทรศัพท์ : 02-515-8987

DATE : 11 กุมภาพันธ์ 2563

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทราเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8989 โทรศัพท์ : 0-2515-8988 E-Mail : info@kinetics.co.th



บริษัท เอ็นวี เซอร์วิส จำกัด

42/ หมู่ที่ 14 ถนน 9 กิโลเมตร 4 ตำบลบางเขน กรุงเทพมหานคร 10230 โทรศัพท์: 02-9435814-5 โทรสาร: 02-9435201
ENVIR SERVICE CO., LTD. 42 Ramithra 14 year 9, Tha Rang, Bangkok, Bangkok 10230 Tel: 02-9435814-5 Fax: 02-9435201

Analyzer Performance Test

Calibrated Date: 31 August 2020

Instruments Information

Analyzer Type: Total Hydrocarbon Analyzer	Manufacturer: Temo Environmental
Model: STC	SIN: 5111-50861-286

Calibration System

Dilutor Model	Calibrator Unit	Standard Gas
ZERO AIR Generator API Model 701	Methane 180 PPM	PPM
SIN: 705	Propane 18 PPM	PPM
ZERO AIR Generator API Model 701	Cylinder AAL5888	
SIN: 1924	Expire Date: 24 May, 2022	

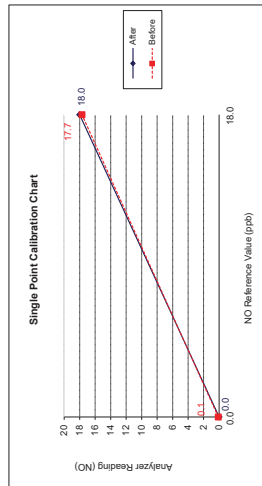
Environment: Temperature: 25 °C Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (ppm)	Reading Value (ppm)	Expected Value (ppm)	Drift%
NH4	0.1	0.0	0.1	17.7	18.0	-1.7
NMHC	0.1	0.0	0.1	17.7	18.0	-1.7

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (ppm)	Reading Value (ppm)	Expected Value (ppb)	Drift%
NH4	0.0	0.0	0.0	18.0	18.0	0.0
NMHC	0.0	0.0	0.0	18.0	18.0	0.0



Calibrate By: Mr. Pasagorn Samol

CERTIFICATE OF CALIBRATION

Certificate No.: CO-2108010/20 Page 1 of total 4 pages

Customer WATER ANALYSIS CENTER CO., LTD.
30/5 Soi Viphavadee 60, Viphavadee Rangsit Road,
Kwaeng Taladbangkhen, Khet Laksi, Bangkok 10210

Equipment pH Meter
Manufacturer METTLER TOLEDO
Model SevenCompact
Serial No. B327527211
ID No. WWL0068
Description Range : 0 - 14 pH, Resolution : 0.01 pH

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

Calibration Location Chemical Laboratory
Received Date 21 August 2020
Calibration Date 21 August 2020

Date of Issue 25 August 2020

Checked by

Act as Technical Manager

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

Approved by

Representative of Managing Director

(Dr. Ekachai Puttitwong)

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

Certificate No.: CO-2108010/20 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	180619	Dec. 24, 2020	NIMT
	7.00	020719	Dec. 28, 2020	
	10.02	190619	Nov. 21, 2020	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	753	3101007	10-0904001/20	Apr. 8, 2021	THC
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	10-0409003/19	Sep. 3, 2020	

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	Nominal Value	UUC Reading	Uncertainty
(mV)	(pH)	pH	mV
177.48	4.00	4.01	177.3
0.00	7.00	7.00	-0.1
-177.48	10.00	10.01	-177.5

UUC : Unit Under Calibration

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

Certificate No.: C0-2108010/20

Page 3 of total 4 pages

Measurement Results (Cont.):

2. Calibration of pH Electrode (Serial No.: 3322791)

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	4.01	182.2	0.013
7.00	7.00	5.4	0.013
10.02	10.00	-163.7	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%.

Certificate No.: C0-2108010/20

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	Model	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	1529-R	B7C853	19E4568	Nov. 28, 2020	TPA
Semi-Standard Platinum Resistance Thermometer	5628	2166	TT-0063-17	Oct. 19, 2020	NIMT
Liquid Bath	XORTS-40A	XO111019	IO-0506003/19	Jun. 7, 2021	THC

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

- TPA, Technology Promotion Association (Thailand-Japan).
- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

(X) Without Adjustment

Dimension of probe : Diameter 5 mm. Sensor Type : RTD (PT100)

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
140	22.00	22.0	0.00	0.058
140	25.00	25.0	0.00	0.058
140	28.00	28.0	0.00	0.058

UUC : Unit Under Calibration

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

- End of Certificate -

Before Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.040	0.077	-0.037	0.0007	0.070
20.30	20.5	-0.20	0.03	1.0
203.0	206	-3.0	0.0	10
1024.0	1049	-25.0	1.1	50
4122.0	4170	48.0	2.1	200

After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.040	0.066	-0.026	0.0010	0.070
20.30	20.3	0.00	0.05	1.0
203.0	203	0.0	0.0	10
1024.0	1025	-1.0	0.5	50
4122.0	4121	1.0	1.9	200

The End of Certificate

Certificate of Calibration

Equipment:	TURBIDIMETER	Certificate No.:	C08200146
Model:	2100N	Issued Date:	03 July 2020
Serial No. (or ID.):	030500003311 (WWL 0019)	Job No.:	KSPR2008902
Manufacturer:	HACH	Page:	1 of 2
Condition:	In Condition		

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	23 °C	±	2 °C
	Humidity	50 %RH	±	15 %RH

Calibration Place:
Environment Laboratory, SPC RT Co., Ltd.
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,
Bangchak, Prakhnong, Bangkok 10260 Thailand

Calibration By: Miss. Allaham A-ma
Calibration Date: 03 July 2020
The Method used: In house method, SPCC-WI-23, base on Hach Manufacturer Method 8195
Traceability: This certificate is traceable to Primary standard Fromazin and StablCal and United States Environmental Protection Agency (EPA) through Hach Company Certificate No. A0080 - A0076 , A0077 - A0077 , A0076 - A0076

SERT
บริษัท เอสพีซี อาร์ท จำกัด
S.P.C. Co., Ltd.

(Mr. Dumrong Boonsopon)
Authorized signatory

Person in charge	Authorized signatory
<p>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.</p> <p>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).</p>	

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 interpreted as a statement of conformity or non-conformity with any standard or specification. The results are not to be used for any purpose other than that for which they were intended.

บริษัท เบลูชี อาร์ท จำกัด
SFC RT CO., LTD.
เลขที่บัญชี 00003 194 เพชรบุรีนคร 57 ถนนพหลโยธิน กรุงเทพมหานคร 10260
Branch 00003 194 Soi Wachitkhamachit 57 Sukhumvit 10/1 Road, Bangkok, Prachinonong, Bangkok 10260 Thailand
Tel : 0 285 4233 Fax : 3300-3308 Foc : 0 285 4234 Email: info@sfc-rt.com Website: www.sfc-rt.com

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CERTIFICATE OF CALIBRATION

Certificate No.: CO-2107006/20 Page 1 of total 2 pages

Customer WATER ANALYSIS CENTER CO., LTD.
30/5 Soi Viphavadee 60, Viphavadee Rangsit Road,
Kwaeng Taladbangkhen, Khet Laksi, Bangkok 10210

Equipment Conductivity Meter
Manufacturer EUTECH
Serial No. 2657889
Description -

Model CON 2700
ID No. WWL0127

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

Calibration Location Chemical Laboratory
Received Date 21 July 2020
Calibration Date 22 July 2020

Date of Issue 22 July 2020

Checked by  **Approved by** 

Act as Technical Manager

Representative of Managing Director

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

(Dr. Ekachai Puttiwong)

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

Certificate No.: CO-2107006/20 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	145.2 µS/cm	S190521025	Feb. 1, 2021	SCP Science
	1.424 mS/cm	S200107016	May 6, 2021	

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

Measurement Results:

Conductivity Standard Solution	Measured Value	Error	Uncertainty (±)
145.2 µS/cm	145.2 µS/cm	0.0 µS/cm	0.82 µS/cm
1.424 mS/cm	1.425 mS/cm	0.001 mS/cm	0.0031 mS/cm

Note : Adjustment points: 145.2µS/cm 1.424mS/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 -



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>

CALIBRATION CERTIFICATE

Certificate No. : AD2012-017-0001

Date Issued : 03-Dec-20

Customer
: Water Analysis Center Co.,Ltd. (Head Office)
30/5 Soi Vibhavadeerangsit 60, Vibhavadeerangsit RD., Talard
Bangkhen, Laksi, Bangkok 10210

Equipment	: DO Meter
Manufacturer	: YSI
Model	: 5000-115V
Serial No.	: 14C 100917
ID No./Tag No.	: -
Date Received	: 02-Dec-20
Date Calibrated	: 03-Dec-20
Calibrated by	: Mr. Kitipob Rungruangsarn

Calibration Method or Calibration Procedure Used

In-house method : CP-77 by direct measurement with standard dissolved oxygen solution at defined temperature.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Technical Manager, Miracle International Technology Company Limited.

Approved by :

(Mr. Tassanai Suksukon)
Technical Manager



Page 1 of 2

Certificate No : AD2012-017-0001

Environment : Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

STD Reading (mg/l)	UUC Reading Before (mg/l)	UUC Reading After (mg/l)	Error (mg/l)	Uncertainty (± mg/l)
9.046	9.07	-	0.024	0.013

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0.00 to 60.00 mg/l
Resolution 0.01 mg/l

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L2002-756.L2002-757 for Data Logger (Lutron Temperature & Humid & Baro) Serial No. B014887, Due 28-Feb-21

MIT Certificate No. L2001-629 for Hi Accuracy Thermometer Serial No. 130508834, Due 07-Jan-21

End of Certificate

Page 2 of 2

Continuation of Report No. : MC 2008273

Page 2 of 3

The Reference Standard :

Description	Report No.	Serial No.	Due date
Data Acquisition/Switch Unit	MC 2007049	93000641	9 June 2021
With Thermocouple Type " T " ID. No.30/1 to 30/9			

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

- Master Calibration Co., Ltd.

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.

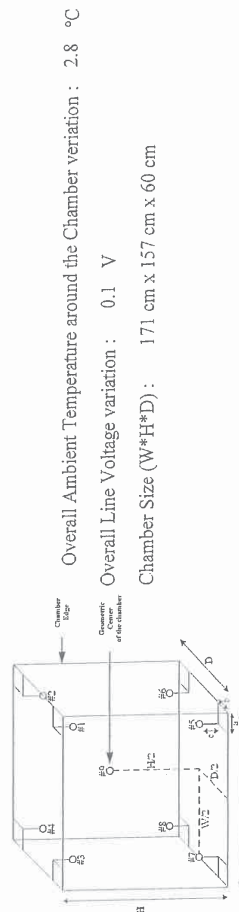
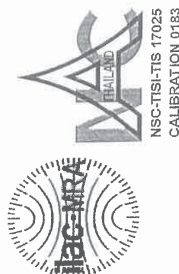


Figure 1 : Sensor Installation Location

Checked by : *Thangorn*

Master Calibration Co.,Ltd.

547 Soi Ratchadaniw, Kwang Samseemok, Khet Huaykwang, Bangkok 10310
Tel : (02) 274 2978-9, (02) 274 2987-8 Fax : (02) 274 2518, (02) 274 2989
http://www.mastercalibration.com



**TEMPERATURE
CONTROLLER ENCLOSURES**

Report No. : MC 2008273

Page 1 of 3

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

Reference Job No. : 20-1755 Received Date : 14 July 2020
Description : Refrigerator
Manufacturer : SANDENINTERCOOL Model : SEC-1500SBD
Serial No. : SEC1500201A-0708-00304 ID. No. : WWL0038
Marking : Additionally for the purpose of identification by this laboratory a label marked

with this report number (MC 2008273) has been attached to the case.

Method : In-House calibration procedure MWL-T-027 this method is reference to

TLAS G-20 "Temperature Controlled Enclosures".

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

Environmental Conditions : Ambient Temperature : (25.1 to 26.0) °C

Relative Humidity : (50.0 to 54.0) %

Date of Calibration : 14 July 2020 Date of Issue : 16 July 2020

Checked by : <i>Thangorn</i>	Approved by : <i>Aittipong</i>
Thangorn Linchaicharoen (Calibration Supervisor)	Aittipong Kanjanawisit (Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

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

Continuation of Report No. : MC 2008273

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	
2.6	3.60	3.47	3.64	3.47	3.39	3.49	3.51	3.54	3.43	0.99

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
2.0	2.6	1.32	0.62	2.64

3. Uncertainty of Measurement

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

This report will certify of the calibrated equipment only.

End of Calibration Report

Checked by : Thanagorn

Certificate of Calibration

Certificate No. : MT20-8158
Page : 1 of 2

Customer : Water Analysis Center Co.,Ltd.
Address : 1/94 M.5, Rojana Industrial Park, T.Kanharm, Ayuthaya 13210

Description : Hot Air Oven
Manufacturer : Memmert
Model : UM500
Serial No. : 5501.0135
Identification No. : WWL0005
Calibration Place : Customer Laboratory
Order No. : 269520
Received date : Sep 04, 2020
Calibration date : Sep 04, 2020
Environment Condition :
Temperature : (25±10) °C
Humidity : (50±30) %RH

Calibration Method : Calibration were conducted using in-house calibration procedure CP-MT-006 According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on DKD-R5-7 guidelines for calibration of climatic chamber edition 07/2009.

Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49001901	MT19-7350	Dec 10, 2020

This result of calibration 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 uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2$, providing a level of confidence of not less than 95%

Calibrated by : Mr.Jiraphan Sreebannasam
Issue date : Sep 10, 2020

Approved by : (Mr.Paruwat Phukian)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd





Imtech Metrological Center Co.Ltd.
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Samae, Bangkok 10220, Thailand
Tel. (662) 909-8820 (Auto 10 lines) www.imchinstrument.com

Certificate No. : MT20-0158

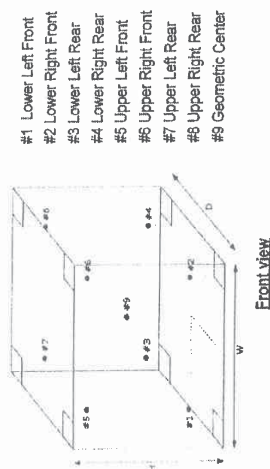
Page : 2 of 2

Result : Without adjustment
Resolution : 0.1 °C

Function : Temperature measurement
Calibration point : 104, 178 °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	104.453	104.460	104.463	104.368	104.371	104.471	104.501	104.300	104.520	0.67
178	180.508	179.957	180.599	180.288	180.321	179.882	180.064	180.392	180.693	0.44

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (± °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.54	0.88	1.3
178.0	178.0	0.30	0.97	1.4



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.

-00-



Certificate of Calibration

Equipment: Balance
Model: BL1500
Serial No. (or ID.): 12503616 (WWL 0011)
Manufacturer: Sartorius
Condition: In condition

Certificate No.: C01201919
Issued Date: 13 June 2020
Job No.: KSPR2007477
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 ± 0.6 °C
Humidity 46 %RH ± 2.4 %RH

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

Calibration By: Mr. Adinan Ninviboon
Calibration Date: 11 June 2020
The Method used: In house method, SPC-WI-47, base on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C02200937

(Mr. Adinan Ninviboon)

S&RT
บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.

(Mr. Rungrod Jenkitrakulchai)

Person in charge
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 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 SPC RT Co., Ltd.

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SPC RT CO., LTD.
สาขาที่ 00003 1194 ซอยสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10250
Branch 00003 1194 Soi Sukhumvit 101/1 Road, Bangkok, Prachinong, Bangkok 10250 Thailand
Tel: 0 2165 4333 Ext. 3300-3308 Fax: 0 285 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

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SPCC-FM-C01-08: 11 Feb 2020

Certificate No.: C01201919

Page: 2 of 2

Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/4 or 1/3 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	
-	-0.1	-0.1	0.0	0.0	0.0

Repeatability: Determination of the standard deviation of weighing balance., Readability

0.1 (g)

Nominal test value (g)	Standard Deviation
100	0.04
1000	0.05

Departure of indication from nominal value., Readability

0.1 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Correction of Balance (g)	Uncertainty (g)	k
1	1.00	1.0	0.0	0.10	2.03
5	5.00	5.0	0.0	0.10	2.03
10	10.00	10.0	0.0	0.10	2.03
20	20.00	20.0	0.0	0.10	2.03
50	50.00	50.0	0.0	0.10	2.03
100	100.00	100.0	0.0	0.10	2.03
200	200.00	200.0	0.0	0.10	2.03
500	500.00	500.0	0.0	0.10	2.03
1000	1000.00	1000.0	0.0	0.10	2.03
1200	1200.00	1200.0	0.0	0.10	2.03
1500	1500.00	1500.0	0.0	0.10	2.03

The End of Certificate

บริษัท เอสพีซี แอร์ จำกัด
 SPC RT CO., LTD.
 สาขาที่ 00003 194 ซอยศรีนครินทร์ 57 ถนนสุขุมวิท 101/1 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
 Branch 00003 194 Soi Wachirathamnathi 57, Sukhumvit 101/1 Road, Bangkok, Prachinong, Bangkok 10260 Thailand
 Tel: 0 2185 4333 Ext. 3300-3306 Fax: 0 2185 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

Your satisfaction is our promise @ SPC

SPCC-FM-C01-08: 11 Feb 2020



MEGAFIL CO., LTD.

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

BSC Certification Test Report

Page 1 of 6

Certificate No. : M 0834/20

Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED

Customer Address : 1/94 Moo 5 T.Kanharm, A.U.-Thai,
Phra Nakhon Si Ayutthaya 13210

Equipment : Biological Safety Cabinet **Class II Type A2**

Manufacturer : Microtech

Model : V6-T

Serial No. : 0972

ID No. : WWL0084

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

Test Date : 06 October 2020

Due Date : 06 October 2021 **or after HEPA filters are replaced or unit is moved**

Test by : Mr.Piyapong Phuesuca

Approved by :
(Mr.Kridsada Thinhutaoei)
Authorized Signatory

Issued Date : 13 October 2020

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

Certificate No. : M 0834/20

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	100

Measurement Data.

0.33	0.37	0.35	0.34
0.26	0.29	0.31	0.30

Average velocity 0.32 m/s (63 FPM.) (Velocity range 0.25 - 0.50 m/s) (49 -98 FPM.)

Uniformity (EN $\pm 20\%$ avg.) 0.26 - 0.38 m/s (51-75 FPM.)

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

Downflow volume (Q) 673 CFM

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer Model 425 S/N : 03004786 Calibration date : 20/02/2020

Certificate No. : M 0834/20

2. Inflow velocity test.

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

0.41	0.48	0.50	0.52	0.55
0.51	0.54	0.56	0.58	0.57
0.54	0.56	0.51	0.49	0.50
0.53	0.54	0.58	0.59	0.61
0.59	0.57	0.54	0.58	0.52

Average Inflow velocity 0.45 m/s (89 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) 356 CFM

Result Summary ☒ Pass ☐ Fail ☐ No document acceptance criteria.

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 03004786 Calibration date : 20/02/2020

3. HEPA filter leak test.

Measurement Data

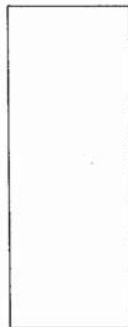
HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	<u>20</u> $\mu\text{g/l}$	<u>< 0.003%</u>	<u>< 0.003%</u>
Exhaust HEPA Filter	<u>20</u> $\mu\text{g/l}$	<u>< 0.003%</u>	<u>< 0.003%</u>

Certificate No. : M 0834/20

Leak location

Supply HEPA Filter

Back



Front

Exhaust HEPA Filter

Back



Front

Result Summary



Pass



Fail

Equipment used (1) : Aerosol Photometer Model ATI-2H S/N 21683 Calibration date 20/02/2020

Equipment used (2) : Smoke Generator Model TDA-6C S/N 21623

4. Airflow smoke patterns test

Measurement Information

1. 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.
2. 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.
3. 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.
4. 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. : M 0834/20

Result Summary

Downflow Pattern test



Pass



Fail



N/A

View screen retention test



Pass



Fail



N/A

Work opening edge retention test



Pass



Fail



N/A

Sash/window seal test



Pass



Fail



N/A

5. Site Installation

Sash Alarm.



Pass



Fail



N/A

Interlock System.



Pass



Fail



N/A

Exhaust System Performance



Pass



Fail



N/A

Remark / Recommendation

ติดตั้ง Site installation ให้มีการตรวจสอบการทำงานของ Function นี้

6. Illumination Test (Lighting) : Option

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

Lux

662	1065	1060	619
962	1610	1593	843

Remark :



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Page 6 of 6

Certificate No. : M 0834/20

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

850	2270	2340	1020
500	1110	1210	580

Remark :