
เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

Calibration Certificate



Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 6 September, 2021 Certification No. 411/21

Page : 1 of 2

Object : Weather Station

Manufacturer : Davis Instruments Inc.

Type : Vantage Pro 2 Model No. 6152C

Serial No. : BF210210025

Customer : BPM ENVIRONMENT CO.,LTD.
124/208 Moo 2, Mahasarakul, Bangkokruay.
Nonthaburi 11130

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.9 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 01563

: HOOK GAGE NO 1425 Pilot Tube Theodor Friedrichs Type 0900.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by : *Wattapap* Signed : *Mr. Pichod Promsut*

Mr. Watcharapol Subwat

Mechanical Engineer



The Result of Calibration

Certification No. 411/21

Page : 2 of 2

6 September, 2021

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure Inches	Vacuum Inches	Pressure hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.8	0.21
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.1	-0.08

Wind Aloft Plotting Board.

US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by : *Wattapap*

Mr. Watcharapol Subwat

Mechanical Engineer



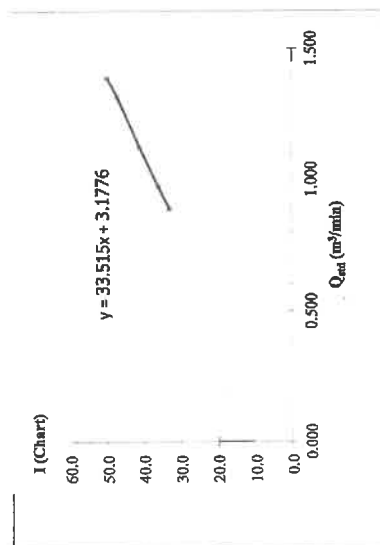


High Volume Air Sampler Calibration Worksheet

Page 1 of 1

Project Site : สวนอุตสาหกรรมโรจนะอยุธยา (โครงการ 4)Location : วัดหนองDate of measurement : 2/6/2022Worksheet No. : C-020622-WWL0093 Calibration OfficeHigh Volume ID : WWL0093 Calibrator ID : WWL0103High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028AHigh Volume S/N : 2729 Calibrator S/N : 3271Ambient Condition Calibrate Date : 11/02/2022Temperature (°C) : 26 Quality Standard Slope : 1.59945Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope : 33.38 Intercept : 3.165 Correlation Coefficient : 0.9995
2	4.40	1.318	47.0	46.81	
3	3.20	1.126	41.0	40.83	
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	

Calibrated by : โศภน

Mr. RATTAPOL BAIKAI

Approved by : โศภน

Mr. RUNGSAKORN KOSUM

FO LAB 55-125

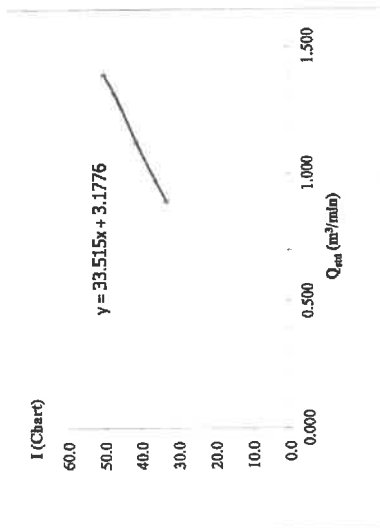
แก้ไขครั้งที่: 1 วันที่แก้ไข: 1 พ.ค. 2560 หน้า: 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Page 1 of 1

Project Site : สวนอุตสาหกรรมโรจนะอยุธยา (โครงการ 4)Location : อ.น.หนองน้ำส้มDate of measurement : 2/6/2022Worksheet No. : C-020622-WWL0094 Calibration OfficeHigh Volume ID : WWL0094 Calibrator ID : WWL0103High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028AHigh Volume S/N : 2729 Calibrator S/N : 3271Ambient Condition Calibrate Date : 11/02/2022Temperature (°C) : 26 Quality Standard Slope : 1.59945Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope : 33.38 Intercept : 3.165 Correlation Coefficient : 0.9995
2	4.40	1.318	47.0	46.81	
3	3.20	1.126	41.0	40.83	
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	

Calibrated by : โศภน

Mr. RATTAPOL BAIKAI

Approved by : โศภน

Mr. RUNGSAKORN KOSUM

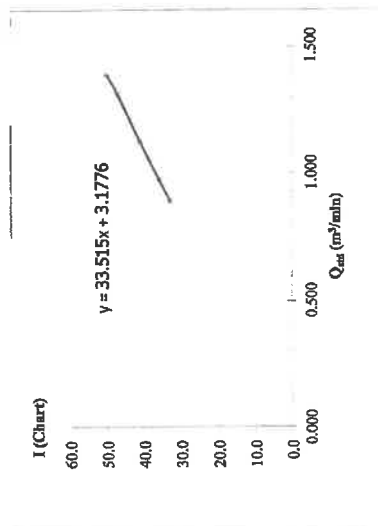
FO LAB 55-125

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

High Volume Air Sampler Calibration Worksheet

Project Site :		สถานศึกษากรมการเกษตร (โครงการ 4)	
Location :		วัดบางคูวัด	
Date of measurement :		2/6/2022	
Worksheet No. :		C-020632-WWL0095	
High Volume ID :		WWL0095	
High Volume Model :		TE-S170 (TSP)	
High Volume SN :		2729	
Ambient Condition			
Temperature (°C) :		26	
Barometric Pressure (mmHg) :		756	
Calibration Date :		11/02/2022	
Calibrator ID :		WWL0103	
Calibrator Model :		TE-S028A	
Calibrator SN :		3271	
Quality Standard Slope :		1.59945	
Quality Standard Intercept :		-0.01874	

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope : 33.38
2	4.40	1.318	47.0	46.81	Intercept : 3.165
3	3.20	1.126	41.0	40.83	Correlation Coefficient : 0.9995
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by: Y₁₀₁₄₅ Approved by: 
Mr. RATTAPOL BAIKAI Mr. RUNGSASEKORN KOSUM

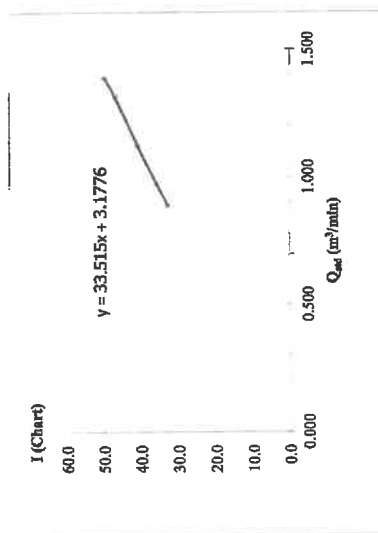
COLAB 55-1/25

แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 ต.ค. 2560 หน้า: 1 ของ 1

1201: 1201

Project Site :	Project Location (Worksheet 4)
Location :	17-06-2022
Date of measurement :	26/2022
Worksheet No. :	C-020622-WVL0096 Calibration Office
High Volume ID :	WWL0096
High Volume Model :	TE-5170 (TSP)
High Volume S/N :	7729
Ambient Condition	
Temperature (°C) :	26
Barometric Pressure (mmHg) :	756
Quality Standard Slope :	1.59945
Quality Standard Intercept :	-0.01874

Test No.	deltan H ₂ O (inch)	Q _{act} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope : 33.38
2	4.40	1.318	47.0	46.81	Intercept : 3.165
3	3.20	1.126	41.0	40.83	Correlation Coefficient : 0.9995
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by : Y. N. M.	Approved by : 
Mr. RATTAPOL BAIKAI	Mr. RUNGSAKORN KOSUM

FOI LAB 5.5-1/25

FOI LAB 5.5-1/25

FOI LAB 5.5-1/25



High Volume Air Sampler Calibration Worksheet

Page 1 of 1

Project Site : สถานศึกษากรมโรงเรียนอยุธยา (โครงการ 4)

Location : สำนักวิชาวิทยาศาสตร์และเทคโนโลยี

Date of measurement : 2/6/2022

Worksheet No. : C-020622-WVL0097 Calibration Office

High Volume ID : WVL0097

High Volume Model : TE-5170 (TSP)

High Volume S/N : 2729

Ambient Condition : 11/02/2022

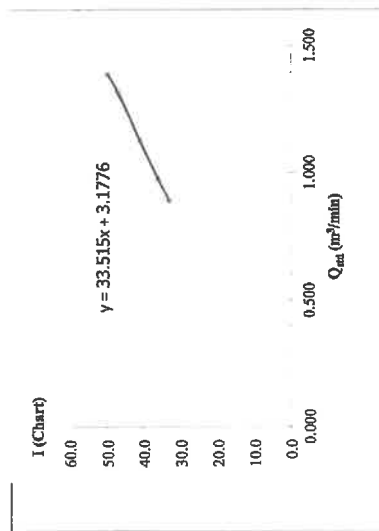
Temperature (°C) : 26

Barometric Pressure (mmHg) : 756

Quality Standard Slope : 1.59945

Quality Standard Intercept : -0.01874

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope : 33.38
2	4.40	1.318	47.0	46.81	Intercept : 3.165
3	3.20	1.126	41.0	40.83	Correlation Coefficient : 0.9995
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by : Y 10/10

Mr. RATTAPOL BAIKAI

Approved by : S

Mr. RUNGSAKORN KOSUM

POLAB 5.5-1/25

วันที่ออกรายงาน : 1 ธันวาคม 2560 หน้า : 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Page 1 of 1

Project Site : สถานศึกษากรมโรงเรียนอยุธยา (โครงการ 4)

Location : สำนักวิชาวิทยาศาสตร์และเทคโนโลยี

Date of measurement : 2/6/2022

Worksheet No. : C-020622-WVL0098 Calibration Office

High Volume ID : WVL0098

High Volume Model : TE-6070 (PM10)

High Volume S/N : 654

Ambient Condition : 11/02/2022

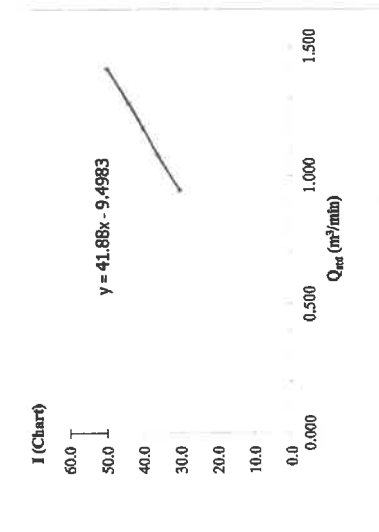
Temperature (°C) : 26

Barometric Pressure (mmHg) : 756

Quality Standard Slope : 1.00155

Quality Standard Intercept : -0.01185

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	51.44	Slope : 26.34
2	4.10	1.283	44.0	27.67	Intercept : -5.973
3	3.50	1.186	40.0	25.15	Correlation Coefficient : 0.9996
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by : Y 10/10

Mr. RATTAPOL BAIKAI

Approved by : S

Mr. RUNGSAKORN KOSUM

POLAB 5.5-1/25

วันที่ออกรายงาน : 1 ธันวาคม 2560 หน้า : 1 ของ 1



High Volume Air Sampler Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงานเย็บผ้า (โครงการ 4) Page 1 of 1

Location : อ.น. พนาภิรัตน์

Date of measurement : 2/6/2022

Worksheet No. : C-020622-WWL0099 Calibration Office

High Volume ID : WWL0099 Calibrator ID : WWL0103

High Volume Model : TE-6070 (PM10) Calibrator Model : TE-5028A

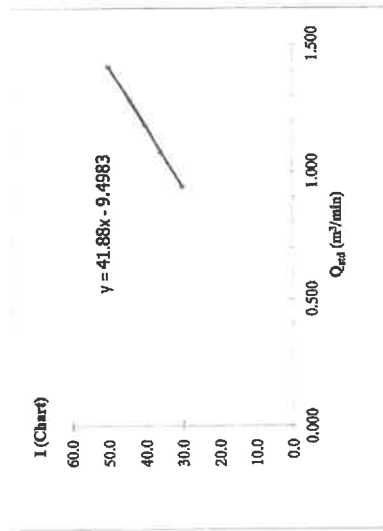
High Volume S/N : 654 Calibrator S/N : 3271

Ambient Condition Calibrate Date : 11/02/2022

Temperature (°C) : 26 Quality Standard Slope : 1.00155

Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01185

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34 Intercept : -5.973 Correlation Coefficient : 0.9996
2	4.10	1.283	44.0	27.67	
3	3.50	1.186	40.0	25.15	
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by : วิศวกร

Mr. RATTAPOL BAIKAI

Approved by :

Mr. RUNGSAKORN KOSUM

POLAB 5.5-125

แก้ไขครั้งที่ : 1 วันที่จัดทำ : 1 พ.ค. 2560 หน้า : 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงานเย็บผ้า (โครงการ 4) Page 1 of 1

Location : อ.น. พนาภิรัตน์

Date of measurement : 2/6/2022

Worksheet No. : C-020622-WWL0100 Calibration Office

High Volume ID : WWL0100 Calibrator ID : WWL0103

High Volume Model : TE-6070 (PM10) Calibrator Model : TE-5028A

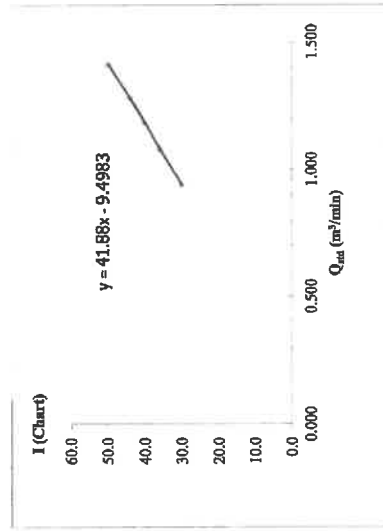
High Volume S/N : 654 Calibrator S/N : 3271

Ambient Condition Calibrate Date : 11/02/2022

Temperature (°C) : 26 Quality Standard Slope : 1.00155

Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01185

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34 Intercept : -5.973 Correlation Coefficient : 0.9996
2	4.10	1.283	44.0	27.67	
3	3.50	1.186	40.0	25.15	
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by : วิศวกร

Mr. RATTAPOL BAIKAI

Approved by :

Mr. RUNGSAKORN KOSUM

POLAB 5.5-125

แก้ไขครั้งที่ : 1 วันที่จัดทำ : 1 พ.ค. 2560 หน้า : 1 ของ 1



High Volume Air Sampler Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะอุบลฯ (โครงการ 4) Page 1 of 1

Location :

Date of measurement :

2/6/2022

Worksheet No. :

C-020622-WWL0101

Calibration Office :

WWL0101

Calibrator ID :

TE-5028A

Calibrator S/N :

3271

Calibrate Date :

11/02/2022

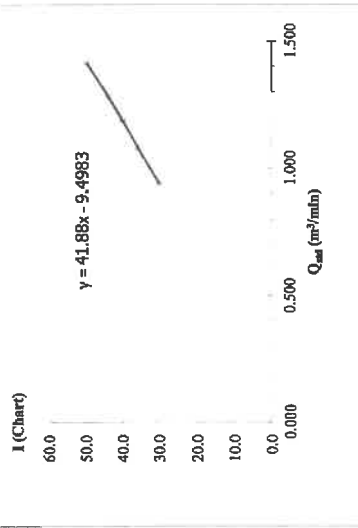
Quality Standard Slope :

1.00155

Quality Standard Intercept :

-0.01185

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34
2	4.10	1.283	44.0	27.67	Intercept : -5.973
3	3.50	1.186	40.0	25.15	Correlation Coefficient : 0.9996
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by :

Y. TWP

Mr. RATTAPOL BAIKAI

Approved by :

Mr. RUNGSAKORN KOSUM

FOLAB 5.5-1/25

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

High Volume Air Sampler Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะอุบลฯ (โครงการ 4) Page 1 of 1

Location :

Date of measurement :

2/6/2022

Worksheet No. :

C-020622-WWL0102

Calibration Office :

WWL0102

Calibrator ID :

TE-5028A

Calibrator S/N :

3271

Calibrate Date :

11/02/2022

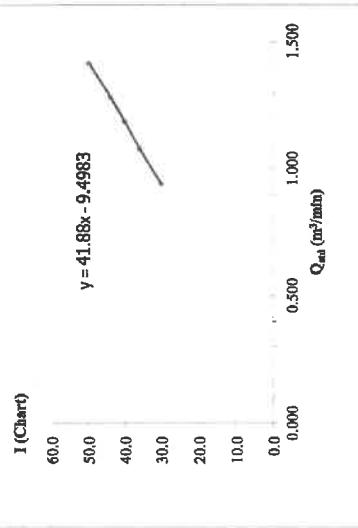
Quality Standard Slope :

1.00155

Quality Standard Intercept :

-0.01185

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34
2	4.10	1.283	44.0	27.67	Intercept : -5.973
3	3.50	1.186	40.0	25.15	Correlation Coefficient : 0.9996
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by :

Y. TWP

Mr. RATTAPOL BAIKAI

Approved by :

Mr. RUNGSAKORN KOSUM

FOLAB 5.5-1/25

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



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EBL BP. 105/1164

Request No. 21-65/0137

CALIBRATION CERTIFICATE

Submitted by : WATER ANALYSIS CENTER CO., LTD.

Address : 1/94 MOO 5, T.KANHAM, A.U-THAI, AYUTTHAYA 13210.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Baugpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Rion

Model : NL-42

Serial No. : 00396803 (WWL 0160)

Microphone : Type UC-52 No.180449

Preamplifier : Type NH-24 No.87814

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MTY4042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 26 Nov. 2021

Date of Calibration : 13-16 Dec. 2021

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FMALMTC.002 Rev.4

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpat@tistr.or.th Website: www.tistr.or.th

Office/Laboratory
Sri 1C, Baugpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 6722-80 ext. 114, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office
196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

W	FO.LAB 6.4-1/28	แก้ไขครั้งที่ : 0	วันที่ส่งกลับใช้ : 1 ม.ค. 2562	หน้า : 1 ของ 1
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แบบบันทึกการทวนสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272 รหัสเครื่องมือ SR004 เกณฑ์การยอมรับ 93.77 ± 0.3, 113.84 ± 0.3

วันที่สอบเทียบ 24/05/65 วันที่สอบเทียบครั้งต่อไป 23/05/66

เครื่อง Digital Thermohygro Meter S/N 105091609

วันที่สอบเทียบ 02/12/64

เครื่อง Sound Level Meter S/N 00396803

วันที่สอบเทียบ 13-16/12/64

การทวนสอบก่อนออกหนึ่งงาน การทวนสอบหลังจากออกหนึ่งงาน

อุณหภูมิ (°C) 24 เกณฑ์การยอมรับ 23.0 ± 3.0 อุณหภูมิ (°C) 24 เกณฑ์การยอมรับ 23.0 ± 3.0

ความชื้นสัมพัทธ์ (%) 46 เกณฑ์การยอมรับ 50.0 ± 15.0 ความชื้นสัมพัทธ์ (%) 46 เกณฑ์การยอมรับ 50.0 ± 15.0

วันที่ทวนสอบ 04/06/65 วันที่ทวนสอบ 13/06/65

Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)
1	93.8	113.9	1	93.8	113.9
2	93.8	113.9	2	93.8	113.9
3	93.8	113.9	3	93.8	113.9
4	93.8	113.9	4	93.8	113.9
5	93.8	113.9	5	93.8	113.9
6	93.8	113.9	6	93.8	113.9
7	93.8	113.9	7	93.8	113.9
8	93.8	113.9	8	93.8	113.9
9	93.8	113.9	9	93.8	113.9
10	93.8	113.9	10	93.8	113.9
X	93.80	113.90	X	93.80	113.90
SD	0.00	0.00	SD	0.00	0.00
% RSD (≤10)	0.00	0.00	% RSD (≤10)	0.00	0.00
ผลการ ทวนสอบ	ผ่าน	ผ่าน	ผลการ ทวนสอบ	ผ่าน	ผ่าน

ผู้บันทึก ผู้ตรวจสอบ



733-TISTR
NSC-TS17-17025
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. BEL. BP. 105/1164

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Unit Under Test			Tolerance Limit Class 2 (\pm dB)
	Measured Value (dB)		Uncertainty (\pm dB)	
	Before adjust	After adjust		
113.91	114.1	113.9	0.0	0.30
				1.4

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (\pm dB)
16.5	0.10

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured Value (dB)	Uncertainty (\pm dB)
A-Weighting	12.6	0.10
C-Weighting	17.8	0.10
Flat	23.2	0.10

Date of Calibration : 13-16 Dec.2021

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Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpal@tistr.or.th Website: www.tistr.or.th

Office/Laboratory
Sol LC, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office
196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-50 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

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Date of Calibration : 13-16 Dec.2021

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733-TISTR
NSC-TS17-17025
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. BEL. BP. 105/1164

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (\pm dB)	Tolerance Limits Class 2 (\pm dB)
A-weighting	94.0	0.0	0.20	0.4
C-weighting	94.0	0.0	0.20	0.4
Flat	94.0	0.0	0.20	0.4

5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (\pm dB)	Tolerance Limits Class 2 (\pm dB)
Fast	94.0	0.0	0.20	0.3
Slow	94.0	0.0	0.20	0.3
Leq	94.0	0.0	0.20	0.3

6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (\pm dB)	Tolerance Limits Class 2 (\pm dB)
137	137.0	0.0	0.30	1.4
136	136.1	0.1	0.30	1.4
135	135.0	0.0	0.30	1.4
134	134.1	0.1	0.30	1.4
133	133.1	0.1	0.30	1.4
132	132.0	0.0	0.30	1.4
131	131.0	0.0	0.30	1.4



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

6. Level linearity on the reference level range (cont.)

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
27	27.0	0.0	0.30	1.4
26	25.9	-0.1	0.30	1.4
25	25.0	0.0	0.30	1.4

7. Level linearity including the level range control

Range	Anticipated		Measured		Deviated		Uncertainty		Tolerance Limits Class 2 (±dB)
	Value (dB)	125	Value (dB)	125.0	Value (dB)	0.0	Value (dB)	0.30	
20-130									1.4

8. Tone burst response

Time Weighting	Toneburst Duration, T _b (ms)	Measured		Deviated		Uncertainty	Tolerance Limits Class 2 (dB)
		Value (dB)	Value (dB)	Value (dB)	Value (dB)		
Fast	200	126.0	0.0	0.20	±1.3		
	2	109.0	0.0	0.20	+1.3; -2.8		
	0.25	99.9	-0.1	0.20	+1.8; -5.3		
Slow	200	119.5	-0.1	0.20	±1.3		
	2	99.9	-0.1	0.20	+1.3; -5.3		
	200	120.0	0.0	0.20	±1.3		
SEL	2	100.0	0.0	0.20	+1.3; -2.8		
	0.25	90.9	-0.1	0.20	+1.8; -5.3		

Date of Calibration : 13-16 Dec.2021

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Head Office
35 Mu 3 Tambon Klong Ha Amphoe Klong Luang
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : tumpai@tistr.or.th Website: www.tistr.or.th

Office/Laboratory
501 I.C. Bangsoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 113, 116
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196 Phrayothin Road, Chatuchak Bangkok 10900,
Thailand
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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

W	FO.LAB 6.4-1/28	แก้ไขครั้งที่ : 0	วันที่บังคับใช้ : 1 ม.ค. 2562	หน้า : 1 ของ 1
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แบบบันทึกการทวนสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272 รหัสเครื่องมือ SR004 เกณฑ์การยอมรับ 93.77 ± 0.3, 113.84 ± 0.3
วันที่สอบเทียบ 24/05/65 วันที่สอบเทียบเครื่องต่อไป 23/05/66
เครื่อง Digital Thermohygro Meter S/N 105091609 รหัสเครื่องมือ PWL 0055
วันที่สอบเทียบ 02/12/64 วันที่สอบเทียบเครื่องต่อไป 01/12/65
เครื่อง Sound Level Meter S/N 00396923 รหัสเครื่องมือ PWL 0161
วันที่สอบเทียบ 13-16/12/64 วันที่สอบเทียบเครื่องต่อไป 12/12/66
การทวนสอบก่อนออกจำหน่าย การทวนสอบหลังจากออกจำหน่าย
อุณหภูมิ (°C) 24 เกณฑ์การยอมรับ 23.0±3.0 อุณหภูมิ (°C) 24 เกณฑ์การยอมรับ 23.0±3.0
ความชื้นสัมพัทธ์ (%) 46 เกณฑ์การยอมรับ 50.0±15.0 ความชื้นสัมพัทธ์ (%) 46 เกณฑ์การยอมรับ 50.0±15.0
วันที่ทวนสอบ 07/06/65 วันที่ทวนสอบ 09/06/65

Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)
1	93.8	113.9	93.8
2	93.8	113.9	93.8
3	93.8	113.9	93.8
4	93.8	113.9	93.8
5	93.8	113.9	93.8
6	93.8	113.9	93.8
7	93.8	113.9	93.8
8	93.8	113.9	93.8
9	93.8	113.9	93.8
10	93.8	113.9	93.8
\bar{X}	93.80	113.90	93.80
SD	0.00	0.00	0.00
%RSD (≤ 10)	0.00	0.00	0.00
ผลการ ทวนสอบ	ผ่าน	ผ่าน	ผ่าน

ผู้บันทึก ผู้ตรวจสอบ
ผู้บันทึก ผู้ตรวจสอบ



73-151TH

NSCT-TIS 17025
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 104/1164

CALIBRATION CERTIFICATE

Submitted by : WATER ANALYSIS CENTER CO., LTD.
Address : 1/94 MOO 5, T. KANHAM, A.U.-THAI, AYUTTHAYA 13210.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1/C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : Rion
Model : NL-42
Serial No. : 00396923 (WWL 0161)
Microphone : Type UC-32 No.180583
Preamplifier : Type NH-24 No.87936

Ambient Environment

Temperature : (23 ± 3) °C
Relative Humidity : (50 ± 15) %
Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistophone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 26 Nov. 2021

Date of Calibration : 13-16 Dec.2021

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Head Office
35 Mu. 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : tump@tistr.or.th Website:www.tistr.or.th

Office/Laboratory
Soi 1/C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : mtc@tistr.or.th

FMEL-MTC-002 Rev.4



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NSCT-TIS 17025
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 104/1164

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Unit Under Test			Tolerance Limit Class 2 (±dB)
	Measured Value (dB)		Deviation (dB)	
	Before adjust	After adjust		
113.91	114.2	113.9	0.0	0.30
				1.4

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 124.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)
16.4	0.10

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured Value (dB)	Uncertainty (±dB)
A-Weighting	12.5	0.10
C-Weighting	17.7	0.10
Flat	23.4	0.10

Date of Calibration : 13-16 Dec.2021

3/8
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35 Mu. 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
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Fax. (66) 0 2577 9009
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Office/Laboratory
Soi 1/C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
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Fax. (66) 0 2579 8592
E-mail : mtc@tistr.or.th

FMEL-MTC-002 Rev.4

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
A-weighting	94.0	0.0	0.20	0.4
C-weighting	94.0	0.0	0.20	0.4
Flat	94.0	0.0	0.20	0.4

5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Fast	94.0	0.0	0.20	0.3
Slow	94.0	0.0	0.20	0.3
Leq	94.0	0.0	0.20	0.3

6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
137	137.0	0.0	0.30	1.4
136	136.0	0.0	0.30	1.4
135	135.0	0.0	0.30	1.4
134	134.0	0.0	0.30	1.4
133	133.0	0.0	0.30	1.4
132	132.0	0.0	0.30	1.4
131	131.0	0.0	0.30	1.4

Date of Calibration : 13-16 Dec.2021

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196 Phahonyothin Road, Chatuchak, Bangkok 10900, Thailand
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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

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6. Level linearity on the reference level range (cont.)

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
27	26.9	-0.1	0.30	1.4
26	25.9	-0.1	0.30	1.4
25	24.9	-0.1	0.30	1.4

7. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
20-130	125	125.0	0.0	0.30	1.4

8. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (dB)
Fast	200	126.0	0.0	0.20	±1.3
	2	108.9	-0.1	0.20	+1.3; -2.8
	0.25	99.9	-0.1	0.20	+1.8; -5.3
Slow	200	119.5	-0.1	0.20	±1.3
	2	99.9	-0.1	0.20	+1.3; -5.3
	0.25	120.0	0.0	0.20	±1.3
SEL	2	100.0	0.0	0.20	+1.3; -2.8
	0.25	90.9	-0.1	0.20	+1.8; -5.3

Date of Calibration : 13-16 Dec.2021

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Office/Laboratory
Sol 1C, Bangpoo Industrial Estate, Sukhumvit Road, Amphoe Muang, Changwat Samutprakan 10280, Thailand
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Office
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CERTIFICATE OF CALIBRATION

Certificate No.: C0-2008004/21

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.

WWL 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

Jayhawks Laboratory (CL&GL)

Received Date

20 August 2021

Calibration Date

20 August 2021

Date of Issue

23 August 2021

Checked by

Approved by

Act as Technical Manager

Representative of Managing Director

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

(Dr. Ekachai Puttiwong)

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FE-169

REV.02 02/24/21

Certificate No.: C0-2008004/21

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	081020	Feb. 1, 2022	NIMT
	7.01	020221	Dec. 25, 2021	
	10.00	091020	Jan. 19, 2022	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	753	3101007	IO-0804001/21	Apr. 7, 2022	THC
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	IO-1006001/21	Jun. 10, 2022	

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	177.4
0.00	7.00	7.00	0.0
-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 Kitipong
REV.02 02/24/21

FE-169

Certificate No.: C0-2008004/21

Page 3 of total 4 pages

Measurement Results (Cont.):

2. Calibration of pH Electrode

pH Standard Solution (pH)	Measured Value (pH)	Measured Value (mV)	Uncertainty (\pm pH)
4.01	4.00	187.0	0.013
7.01	7.00	11.1	0.013
10.00	10.02	-161.6	0.013

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

Temperature stability of micro bath : $25 \pm 0.2^\circ\text{C}$

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

Kitipong

REV.02 0224/21

FE-169

Certificate No.: C0-2008004/21

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	20E3985	Nov. 9, 2021	TPA
Platinum Resistance Thermometer	5626	4853	C0A30046	Oct. 28, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	10-0306002/21	Jun. 3, 2023	THC

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

- TPA, Technology Promotion Association (Thailand-Japan).

- FLUKE, Fluke Corporation, U.S.A.

- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

(X) Without Adjustment

Dimension of probe : Diameter 4 mm. Sensor Type : RTD (PT100)

Immersion Depth (mm.)	Standard Reading ($^\circ\text{C}$)	UUC Reading ($^\circ\text{C}$)	Correction ($^\circ\text{C}$)	Uncertainty (\pm $^\circ\text{C}$)
120	22.00	22.0	0.00	0.058
120	25.00	25.0	0.00	0.058
120	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 -

Calibrated by

Pongsak

REV.02 0224/21

FE-169



THAI HEART CALIBRATION CO., LTD.
112/1 Moo-5, Phad Sai Muang, Samut Prakan 10280
Tel: 02-29457102, 02-25794455, 02-25782946 Fax: 02-25783517



CERTIFICATE OF CALIBRATION

Certificate No.: C0-2107005/21 Page 1 of total 2 pages

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

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

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

Calibration Location Jayhawks Laboratory (CL&GL)
Received Date 21 July 2021
Calibration Date 21 July 2021

Date of Issue 22 July 2021

Checked by

Approved by

Act as Technical Manager

Representative of Managing Director

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

(Dr. Ekachai Putitwong)

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

FE-169

REV.02 02/24/21

Certificate No.: AD2012-017-0001

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

Relative Humidity: (30 ± 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

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

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 1.06657.0500 K52300357 - 31 Mar 2022

- 2). Traceability This certification is traceable to
☒ Merck KGaA 64271 Darmstadt
☐ DKK Corporation

Result Of Calibration

Standard Solution (mg/l) at 26.0°C	Before Adjust		After Adjust	
	Indicator	Error	Indicator	Error
Zero	0.00	+ 0.10	0.00	-
Span	7.99	+ 0.22	7.99	-

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

Calibrated By P.
(Ms. Phanee Yooyen)
Technician

929,929/1 Soi Pattanakarn 30, Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250
Head Office : Tel. 02-315-8984 ext.1 Fax.02-315-4961 E-mail : ascc@automation.co.th
Rongying Branch : 1715 Huayong Rd., A. Muang, Rongying 21150 Tel. 033-592-152 Fax. 036-692-345
Lamphun Branch : 122/5 M.4, T.Ban Klang, A.Muang, Lamphun 51000 Tel/Fax. 063-581-576
website : www.automation.co.th

SV 212001/2021

Cert. No. WAC-065
Page 1 of 2

CERTIFICATE OF CALIBRATION

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

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

Date Of Received : 03 / 12 / 2021
Date Of Calibration : 03 / 12 / 2021

Ambient Condition : Temperature 24 °C
Humidity 47 % RH

Calibrated By : P.
(Ms. Phanee Yooyen)
Technician

Approved By : P.
(Mr. Nipon Phungsomsak)
Technical Manager

Date Of Issue : 03 / 12 / 2021

This Certificate may not be reproduced other than in full, except with the prior written approval of the head of the industrial instruments calibration center.

Certificate No.: MC 2107214

Certificate of Calibration

TEMPERATURE CONTROLLER ENCLOSURES



NSC-TS-17023
CALIBRATION 0183

Certificate No.: MC 2107214

Page 1 of 3



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

Reference Job No. : 21-1565 Received Date : 13 July 2021
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 certificate number (MC 2107214) 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 : (26.3) °C

Relative Humidity : (56.4 to 59.3) %

Date of Calibration : 13 July 2021 Date of Issue : 14 July 2021

Checked by : Thanagorn
Thanagorn Limchaicharoen
(Calibration Supervisor)

Approved by : Aittipong
Aittipong Kanana Visit
(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]

The Reference Standard :

Description : Data Acquisition/Switch Unit
Certificate No. : MC 2009600
Serial No. : MY44095818
Due date : 8 August 2021
With Thermocouple Type " T " ID. No. 6/1 to 6/9

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

- Master Calibration Co., Ltd. And Quality Reborn 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.

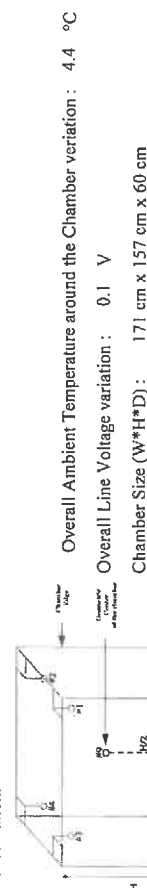


Figure 1 : Sensor installation location

Checked by : Thanagorn

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

Certificate No.: MC 2107214

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	#9	
2.6	4.0	4.0	4.1	4.0	3.9	3.8	3.7	3.8	3.4	1.2

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
2.0	2.6	2.7	1.4	5.8

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

This report will certify of the calibrated equipment only.

End of Certificate

Checked by : Thanagorn

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



TEMPERATURE
CONTROLLER ENCLOSURES

Report No.: MC 2103787

Page 1 of 3

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

Reference Job No. : 21-0710 Received Date : 25 March 2021
Description : Oven
Manufacturer : Memmert Model : UF260
Serial No. : B620.0814 ID. No. : N/A
Marking : Additionally for the purpose of identification by this laboratory a label marked with this report number (MC 2103787) 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 : (31.8 to 35.3) °C
Relative Humidity : (44.7 to 55.9) %

Date of Calibration : 25 March 2021 Date of Issue : 26 March 2021

Checked by : Thanagorn Approved by : Aittipong
Thanagorn Limchaicharoen Aittipong Kaijanavasi
(Calibration Supervisor) (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.

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]

Continuation of Report No. : MC 2103787

Page 2 of 3

The Reference Standard :

Description Report No. Serial No. Due date
Data Acquisition/Switch Unit MC 2016027 MY41010916 10 January 2022
With Thermocouple Type "T" ID. No.17/1 to 17/9

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.

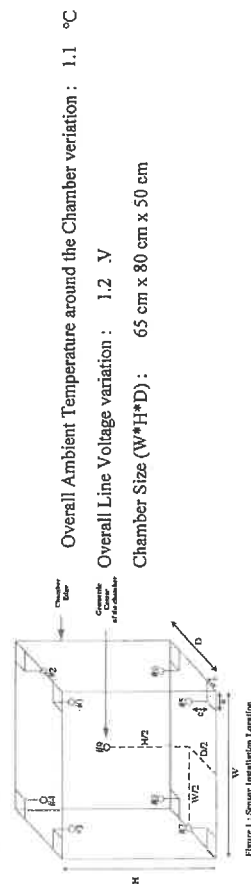


Figure 1 : Sensor Installation Location

Checked by : *Thanyaporn*

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]

Continuation of Report No. : MC 2103787

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
104.0	103.7	103.7	103.7	103.9	104.2	104.3	104.3	104.3	104.0	0.67
180.0	179.1	179.1	179.0	179.2	180.4	180.5	180.6	180.6	180.2	0.99

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	0.27	0.44	1.0
180.0	180.0	0.29	1.31	1.9

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 : *Thanyaporn*

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]

Continuation of Report No. : MC 2103787

The Reference Standard :

Description	Report No.	Serial No.	Due date
Data Acquisition/Switch Unit	MC 2016027	MY41010916	10 January 2022
With Thermocouple Type "T" ID. No.17/1 to 17/9			

Report No.: MC 2103787

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

Reference Job No. : 21-0710 Received Date : 25 March 2021
Description : Oven
Manufacturer : Memmert Model : UF260
Serial No. : B620.0814 ID. No. : N/A
Marking : Additionally for the purpose of identification by this laboratory a label marked with this report number (MC 2103787) 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 : (31.8 to 35.3) °C

Relative Humidity : (44.7 to 55.9) %

Date of Calibration : 25 March 2021 Date of Issue : 26 March 2021

Checked by : Thanagorn Approved by : Aittipong
Thanagorn Limchaicharoen Aittipong Kaifajana Nasit
(Calibration Supervisor) (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.

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]

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.

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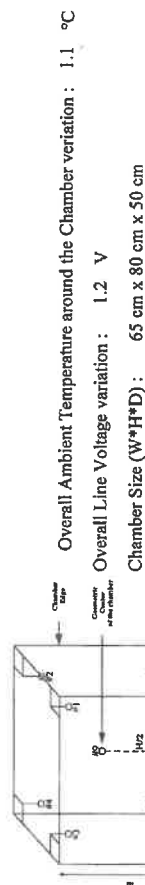


Figure 1: Sensor Installation Location

Checked by : Thanagorn

[MCF-Q-077 ; Rev.5 ; Date : 15/07/2014]

Continuation of Report No. : MC2103787

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
104.0	103.7	103.7	103.7	103.9	104.2	104.3	104.3	104.3	104.0	0.67
180.0	179.1	179.1	179.0	179.2	180.4	180.5	180.6	180.6	180.2	0.99

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	0.27	0.44	1.0
180.0	180.0	0.29	1.31	1.9

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



Certificate of Calibration

Equipment: Balance
Model: BL210S
Serial No. (or ID.): 15808131 (WWL 0022)
Manufacturer: Sartorius
Condition: In condition
Certificate No.: C01211841
Issued Date: 24 June 2021
Job No.: KSPR2107969
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 27 °C ± 0.3 °C
Humidity 40 %RH ± 1.7 %RH

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

Calibration By: Mr. Phakapol Donnin
Calibration Date: 10 June 2021
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. C02210017

SERT
บริษัท เอสพีซี ออร์ที จำกัด
SPC RT Co., Ltd.

Ringrod
(Mr. Rungrod Jenkitrakulchai)
Authorized signatory

Mr. Phakapol Donnin
(Mr. Phakapol Donnin)
Person in charge

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.

Checked by: *Thunagon*

บริษัท เอสพีซี ออร์ที จำกัด
SPC RT Co., Ltd.
เลขที่ 00003 194 หมู่ 5 ถนนโรจนา 57, ตำบลคันหัน 57, อำเภอยะยง, จังหวัดอยุธยา 13210
เบอร์ 0 2105 4303 ถึง 3300-3308 Fax: 0 2105 4403 E-mail: info@spcrt.com Website: www.spcrt.com

[MCE-Q.077 ; Rev.5 ; Date : 15/07/2014]

SPCC-FM-C01-10: 23 Nov 2020

Certificate No.: C01211841

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					50	(g)
		Reference Points (g)						
		A	B	C	D	E		
		-	0.0000	-0.0001	-0.0001	0.0000		

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

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00005

Departure of indication from nominal value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Correction of Balance (g)	Uncertainty (g)	k
1	1.00001	1.0000	0.0000	0.00010	2.03
2	2.00002	2.0000	0.0000	0.00010	2.03
5	4.99999	5.0000	0.0000	0.00010	2.03
10	10.00000	10.0000	0.0000	0.00011	2.02
20	19.99999	20.0000	0.0000	0.00011	2.02
50	49.99997	50.0000	0.0000	0.00012	2.01
70	69.99996	70.0000	0.0000	0.00015	2.00
100	100.00000	100.0000	0.0000	0.00017	2.00
120	119.99999	120.0001	-0.0001	0.00021	2.00
150	149.99997	150.0000	0.0000	0.00023	2.00
200	199.99990	200.0003	-0.0004	0.00029	2.00

The End of Certificate

Bara Scientific
Branch of Success

Bara Scientific Co., Ltd.

968 U Chu Lieng Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375466-7
www.barascientific.com

Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-135/21
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer SHIMADZU
Serial No. A11635405698CD
ID No. WWL0082
Date of receipt 30 April 2021
Date of calibration 30 April 2021
Date of issue 10 May 2021

Customer name Water Analysis Center Co., Ltd.
Address 1/84 Moo 5, T.Kanitham, A.Uthai, Ayuthaya 13210

Temperature (29.9-32.1) °C (On site)
Humidity (48.7-52.8) %RH (On site)

Equipment condition Good Operation

Calibration Location Laboratory Room Water Analysis Center

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 79870 and 79871
Photometric Accuracy is traceable to certificate No. 79672 and 79673
Stray Light is traceable to certificate No. 79669
The above certificate are traceable to SI unit through Siama Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0859)

Calibrated by Mr. Waruth Jangphung

Approved by

Mr. Kanchit Choothep
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor7 Rama4 Road
Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6376496-7
www.barascientific.com



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968 U Chu Liang Building Floor7 Rama4 Road
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Certificate of Calibration

Certificate No.

BSCC-JV-135/21

Number of Page(s)

2 of 3

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
360.89	360.82	-0.07	0.18
418.53	418.71	0.18	0.18
445.82	446.38	0.56	0.18
453.67	453.58	-0.09	0.18
459.99	459.80	-0.19	0.18
638.00	638.10	0.10	0.18
431.22	431.38	0.16	0.18
513.39	513.57	0.18	0.18
528.90	528.82	-0.08	0.18
572.99	572.58	-0.41	0.18
585.25	585.37	0.12	0.18
684.50	684.65	0.15	0.18
741.02	741.14	0.12	0.18
879.41	879.29	-0.12	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (A)
235	CNR	CNR	CNR	CNR
257	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6358	0.6310	-0.0048	0.0075

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Tel : 02-6324300 Fax : 02-6376496-7
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Certificate of Calibration

Certificate No.

BSCC-JV-135/21

Number of Page(s)

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Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.6473	0.6511	0.0038	0.0042
	0.7625	0.7655	0.0030	0.0042
	1.0484	1.0525	0.0041	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5388	0.5401	0.0013	0.0042
	0.7446	0.7464	0.0018	0.0042
	1.0235	1.0259	0.0024	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.4873	0.4806	0.0067	0.0042
	0.6868	0.6882	0.0014	0.0042
	0.8453	0.8453	0.0000	0.0042
546.1	0.5009	0.5027	0.0018	0.0042
	0.8950	0.8950	-0.0002	0.0042
	0.9556	0.9556	-0.0012	0.0042
580.0	0.0000	0.0000	0.0000	0.0042
	0.5282	0.5303	0.0021	0.0042
	0.7228	0.7218	-0.0010	0.0042
	0.8983	0.8974	-0.0009	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5140	0.5151	0.0011	0.0042
	0.6902	0.6888	-0.0013	0.0042
	0.9539	0.9519	-0.0020	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.97±0.11nm	200.40	0.9524	2.0215

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONS Accredited.

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

End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.



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80-82 ถนนประชาวิไล แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatai Rd., Bangkokkhrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawan@thainique.com, Website : www.thainique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 240PS AFS 791320004
Customer: Whitey Amalgam & Dental Co., Ltd
Date: 7 Apr 2021

Safety

- ☒ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner
- ☒ Flame, Clean nebulizer, spray chamber and burner
- ☒ Flame, Check liquid trap interlock, burner interlock, pressure relief bung interlock and shield interlock
- ☐ Furnace, Clean work head, electrode and shroud N/A
- ☐ Furnace, Clean PSD and PSD tray N/A
- ☐ Furnace, Check water pressure N/A
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectraAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.5 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 22.7 (should be $\leq 64\%$ or $\leq 380V$)
- ☒ Flame, Check D2 lamp is work



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Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawan@thainique.com, Website : www.thainique.com

Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☐ Furnace, Check camera and align** N/A

**Option for Graphite Zeeman only

Mechanisms

- ☒ Flame, Check the burner adjuster
- ☐ Furnace, Check PSD accessories N/A

Analytical performance

- ☒ Clear the sample compartment
- ☒ Flame, Check uptake rate form 7.2-10.6 mL per minute = 10.4 mL/min
- ☒ Test Photometric noise, STDV = 0.0002 Abs (should be ≤ 0.00050 Abs)
- ☒ Flame, Test high solids nebulizer setting use
 - Air/acet Cu 5 ppm = 0.76 Abs, and Precision (%RSD)= 0.5 % (should be > 0.55 Abs and $< 0.5\%$ RSD)
 - or
 - N2O/Acet Cu 5 ppm = _____ Abs, and Precision (%RSD)= _____ % (should be > 0.3 Abs and $< 0.5\%$ RSD)
- ☐ Furnace, Characteristic mass and sensitivity Cu 25 ppb = _____ Abs, and Precision (%RSD)= _____ % (should be ≥ 0.15 Abs and $\leq 4.0\%$ RSD)

SIGN :

Engineer

Singha Nakhon
(.....)

Customer :

Kot
(.....)

SVD Results Report

VARIAN

Report ID: 4 Diagnostic Start Time: 4/7/2021 11:21:56 AM Diagnostic End Time: 4/7/2021 12:04:17 PM
 Customer: Water Analysis Center Co., Ltd. Service Engineer: Suriya Nacharoen
 Address: Uthai Ayuthaya Contact Details: Kanisara

Instrument Configuration

Configuration:

Serial Number: MY18230004 Turret Type: Automatic
 Instrument Model: Varian AA140/240/280 Number Of Lamps: 4
 Flame Instrument: True Mono Type: Automatic
 Furnace Instrument: True Gasbox Type: Y Gas Box
 Zeeman Present: False Auto Burner Adjuster: False
 Internal Zeeman: False Mains Frequency: 50
 Internal UltraAA: False Firmware Version: 2.12
 Optics Type: Double Beam Photomultiplier Type: Normal(900nm)
 D2 BG Correction Fitted: True PWB Version: 181
 Boot Block Version: 2.02

EEPROM Data:

Instrument Run Hours: 16347.950 D2 Run Hours: 4626.033
 Zero Wavelength Offset: 25.877 D2 Serial Number: not set
 Mono Correction: -0.605 D2 Install Date: 1/1/1970
 Flame Hours: 5461.417 D2 Original Intensity: 1.000
 D2 Last Intensity: 400.000

Frequency:

Averaging Period: 30.0
 Datapoint Count: 20
 Upper Limit: 51.00 Highest Measured Frequency: 50.00
 Average Frequency: 50.00
 Lower Limit: 49.00 Lowest Measured Frequency: 50.00
 Result: Passed

Report Generated At: 4/7/2021 12:07:04 PM

1

SVD Results Report

2

Report Generated At: 4/7/2021 12:07:04 PM

SVD Results Report

Power Supply:

Averaging Period: 30.0
 Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.10	13.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.80	Passed
5.00 V Rail	4.50	5.00	5.50	Passed
310.00 V Rail	279.00	318.00	341.00	Passed

Optics

Beam Balance:

Lamp Type: Copper

Lamp Socket Used: 3

Peak Selected: 324.80

Lamp Alignment:

Performed

Wavelength Repeatability:

Lamp Used: Copper

Peak Used(nm): 324.750

Connected to Socket: 3

Lamp Current(mA): 4

Slit Width(nm): 0.2

Slit Height: Normal

Lamp Alignment:

Performed

Lower Limit(nm) 324.551

Upper Limit(nm) 324.671

(Approach from Zero Order)

Sample 1: 324.611

Sample 2: 324.611

Sample 3: 324.611

Sample 4: 324.611

Sample 5: 324.615

Sample 6: 324.611

Sample 7: 324.615

Sample 8: 324.611

Sample 9: 324.615

Sample 10: 324.611

Mean: 324.613

Standard Deviation: 0.002

Result:

Passed

Optics

Beam Balance:

Lamp Type: Copper

Lamp Socket Used: 3

Peak Selected: 324.80

Lamp Alignment:

Performed

X' Lamp Screw

Sample Peak: 0.793

80% Sample Peak Mark: 0.793

Upper Limit: 1.152

Lower Limit: 1.001

Ref Pt 1: 1.076

Ref Pt 2: 1.072

X Lamp Screw Result:

Passed

Y' Lamp Screw

Sample Peak: 0.949

80% Sample Peak Mark: 0.949

Upper Limit: 1.204

Lower Limit: 1.047

Ref Pt 1: 1.125

Ref Pt 2: 1.126

Y Lamp Screw Result:

Passed

Grating Squareness:

Lamp Element(s): Copper

Lamp Turret Position: 3

Lamp Current(mA): 4.00

Slit Width(nm): 0.5

1st Order Wavelength(nm): 324.80

Lamp Alignment:

Performed

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	<div>Passed</div>
First Order	324.45	324.62	325.15	<div>Passed</div>
Second Order	649.23	649.54	649.97	<div>Passed</div>

ภาคผนวก ข - 25

Report Generated At: 4/7/2021 12:07:04 PM

3

SVD Results Report

SVD

Report Generated At: 4/7/2021 12:07:04 PM

4

SVD Results Report

SVD

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	258	297	Passed
S1	156	166	191	Passed
S2	271	300	332	Passed
S3	474	516	579	Passed
S4	825	933	1008	Passed
S5	1435	1555	1754	Passed
S6	2498	2802	3053	Passed
S7	4347	4795	5313	Passed

Interlocks:

Burner Fitted: Working
N2O Burner Fitted: Working
Flame Shield Closed: Working
Gas Control Fitted: Untested
Pressure Release Bung Fitted: Working
Liquid Trap Fitted: Working

Flame Detect: Working
GCU Active: Working
Oxidant Pressure: Working
Oxidant Changeover: Working
Ignition: Working

Auto Lamp Recognition:

Lamp 1: 42 - Potassium (K)
Lamp 2: 53 - Sodium (Na)
Lamp 3: 14 - Copper (Cu)
Lamp 4: 37 - Nickel (Ni)
Lamp 5: Not Supported
Lamp 6: Not Supported
Lamp 7: Not Supported
Lamp 8: Not Supported

Result:

Passed

GTA Temperature Monitoring:

Not Performed

Notes:

C2104SU29 PM 1/2

Signatures:

Water Analysis Center Co., Ltd Date _____ Suriya Nachaen _____ Date _____



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80-82 Prachathipatai Rd., Bangkokphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thnwat@thaiunique.com, Website : www.thaiunique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: AA 240 FS & AA0911 M073

Customer : Water Analysis Center Co., Ltd.

Date: 04 Feb 2021

Safety

- ☒ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner
- ☒ Flame, Clean nebulizer, spray chamber and burner
- ☒ Flame, Check liquid trap interlock, burner interlock, pressure relief bung interlock and shield interlock

Furnace, Clean work head, electrode and shroud N/A

Furnace, Clean PSD and PSD tray N/A

Furnace, Check water pressure N/A

Check drain tube

Check exhaust system

Check gas pressure sensor interlock

Check and all gas hoses for SpectAA

Clean computer control

Optics

☒ Inspect/Replace that external optics surfaces

☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.3 nm

☒ Check that PMT % Gain the copper at 324.8 nm, 0.5 mA, 0.5 nm slit width, Gain = 56 % (should be $\leq 64\%$ or $\leq 380V$)

☒ Flame, Check D2 lamp is work



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80-82 Prachathipatai Rd., Bangkokphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thnwat@thaiunique.com, Website : www.thaiunique.com

Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☐ Furnace, Check camera and align** N/A

**Option for Graphite Zeeman only

Mechanisms

- ☒ Flame, Check the burner adjuster
- ☐ Furnace, Check PSD accessories N/A

Analytical performance

☒ Clear the sample compartment

☒ Flame, Check uptake rate form 7.2-10.6 mL per minute = 9.3 mL/min

☒ Test Photometric noise, STDV = 0.0001 Abs (should be ≤ 0.00050 Abs)

☒ Flame, Test high solids nebulizer setting use

-Air/acet Cu 5 ppm = 0.75 Abs, and Precision (%RSD) = 0.5 % (should be > 0.55 Abs and $< 0.5\%$ RSD)

or

-N2O/Acet Cu 5 ppm = _____ Abs, and Precision (%RSD) = _____ % (should be > 0.3 Abs and $< 0.5\%$ RSD)

☐ Furnace, Characteristic mass and sensitivity Cu 25 ppb = _____ Abs, and Precision (%RSD) = _____ % (should be ≥ 0.15 Abs and $\leq 4.0\%$ RSD)


SIGN :

Engineer

Suriya Nacharoen
(Signature)

Customer :

Kat
(Signature)

**VARIAN**

SVD Results Report

Report ID:3 Diagnostic Start Time:05-Dec-20 10:38:29 AM Diagnostic End Time:04-Feb-21 11:58:44 AM

Customer: Water Analysis Center Co., Ltd. Service Engineer: SuriyaNachareon

Address: Prana khron si ayuthaya Contact Details: K_Kanitsara

Instrument Configuration

Configuration:

Serial Number: AA0911M073	Turret Type: Automatic
Instrument Model: Varian AA140/240/280	Number Of Lamps: 4
Flame Instrument: True	Mono Type: Automatic
Furnace Instrument: True	Gasbox Type: Y Gas Box
Zeeman Present: False	Auto Burner Adjuster: False
Internal Zeeman: False	Mains Frequency: 50
Internal UltraAA: False	Firmware Version: 2.12
Optics Type: Double Beam	Photomultiplier Type: Normal(900nm)
D2 BG Correction Fitted: True	PWB Version: 181
Boot Block Version: 2.02	

EEPROM Data:

Instrument Run Hours: 20613.650	D2 Run Hours: 2906.000
Zero Wavelength Offset: -18.731	D2 Serial Number: not set !
Mono Correction: -0.370	D2 Install Date: 01-Jan-70
Flame Hours: 4025.000	D2 Original Intensity: 1.000
	D2 Last Intensity: 661.000

Frequency:

Averaging Period: 30.0	
Datapoint Count: 20	
Upper Limit: 51.00	Highest Measured Frequency: 50.00
Average Frequency: 50.00	
Lower Limit: 49.00	Lowest Measured Frequency: 50.00
Result: Passed	

Power Supply:

Averaging Period: 30.0				
Datapoint Count: 20				
12.00V Rail	Lower Limit (V) 10.80	Actual (V) 12.20	Upper Limit (V) 13.20	Result: Passed
-12.00V Rail	-13.20	-12.00	-10.80	Passed
5.00V Rail	4.50	5.10	5.50	Passed
310.00V Rail	279.00	318.00	341.00	Passed

Optics

Beam Balance:

Lamp Type: Copper

Lamp Socket Used: 3

Peak Selected: 324.80

Lamp Alignment:

Performed

'X' Lamp Screw

Sample Peak: 0.748

80% Sample Peak Mark: 0.748

Upper Limit: 1.145

Ref Pt 1: 1.070

Ref Pt 2: 1.073

Lower Limit: 0.995

X Lamp Screw Result:

Passed

'Y' Lamp Screw

Sample Peak: 0.778

80% Sample Peak Mark: 0.778

Upper Limit: 1.139

Ref Pt 1: 1.085

Ref Pt 2: 1.085

Lower Limit: 0.980

Y Lamp Screw Result:

Passed

Grating Squareness:

Lamp Element(s): Copper

Lamp Turret Position: 3

Lamp Current(mA): 4.00

Slit Width(nm): 0.5

1st Order Wavelength(nm): 324.80

Lamp Alignment:

Performed

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result
Zero Order	-0.10	0.00	0.10	<div>Passed</div>
First Order	324.45	324.73	325.15	<div>Passed</div>
Second Order	649.23	649.56	649.97	<div>Passed</div>

Wavelength Repeatability:

Lamp Used: Copper

Peak Used(nm): 324.750

Connected to Socket: 3

Lamp Current(mA): 4

Slit Width(nm): 0.2

Slit Height: Normal

Lamp Alignment:

Performed

Lower Limit(nm) 324.751

(Approach from Zero Order)

Sample 1: 324.811

Sample 3: 324.811

Sample 5: 324.815

Sample 7: 324.815

Sample 9: 324.816

Mean: 324.812

Upper Limit(nm) 324.871

(Approach from end)

Sample 2: 324.807

Sample 4: 324.811

Sample 6: 324.811

Sample 8: 324.811

Sample 10: 324.815

Standard Deviation: 0.003

Result:

Passed

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode				
	Lower Limit	Actual	Upper Limit	Result:
S0	114	248	297	Passed
S1	158	165	181	Passed
S2	271	294	332	Passed
S3	474	508	579	Passed
S4	825	908	1008	Passed
S5	1435	1516	1754	Passed
S6	2498	2723	3053	Passed
S7	4347	4681	5313	Passed

Interlocks:

Burner Fitted:

Working

N2O Burner Fitted:

Working

Flame Shield Closed:

Working

Gas Control Fitted:

Untested

Pressure Release Bung Fitted:

Working

Liquid Trap Fitted:

Working

Flame Detect:

Working

GCU Active:

Working

Oxidant Pressure:

Working

Oxidant Changeover:

Working

Ignition:

Working

Auto Lamp Recognition:

Lamp 1: 50 - Selenium (Se)

Lamp 5: Not Supported

Lamp 2: 3 - Arsenic (As)

Lamp 6: Not Supported

Lamp 3: 14 - Copper (Cu)

Lamp 7: Not Supported

Lamp 4: 42 - Potassium (K)

Lamp 8: Not Supported

Result:

Passed

GTA Temperature Monitoring:

Not Performed

Notes:

C2102SU11 PM1/2

Signatures:

Suriya Nacharoen

04 Feb 21

Water Analysis Center Co., Ltd.

Date

ภาคผนวก ซ - 30

Report Generated At: 04-Feb-21 11:58:45 AM

5

SVD Results Report SVD

Report Generated At: 04-Feb-21 11:58:45 AM

6

SVD Results Report SVD

BSC Certification Test Report

Page 1 of 6

Certificate No. : M0979/21
Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED
Customer Address : 1/94 Moo 5 T.Kanbarn, 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 : 23/09/2021
Due Date : 23/09/2022 or after HEPA filters are replaced or unit is moved
Test by : Mr. Puwadol Keavila

Approved by : 
(Mr.Kridsada Thinhustoei)
Authorized Signatory

Issued Date : 24/09/2021

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

This certificate may not be reproduced other than in full except with the prior written approval of the Megafil Company Limited.

Page 2 of 6

Certificate No. : M0979/21

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 mm.

Measurement Data.

0.34	0.37	0.36	0.35
0.32	0.33	0.32	0.34

Average velocity 0.34 m/s (67 FPM.) **Velocity range** 0.25-0.50 m/s (49-98 FPM.)

Uniformity(EN: +/-20%avg. 0.27 - 0.41 m/s (54 - 80 FPM.)

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

Downflow volume (Q) 716 CFM.

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer **Model** 425 **S/N :** 03004786 **Calibration date :** 23/02/2021

Certificate No. : M0979/21

2. Inflow velocity test.

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

0.57	0.59	0.56	0.61	0.63
0.58	0.6	0.56	0.59	0.58
0.61	0.57	0.56	0.54	0.56
0.59	0.56	0.62	0.59	0.62
0.59	0.57	0.63	0.59	0.58

Average Inflow velocity 0.50 m/s (98 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) 392 CFM

Result Summary ☒ Pass ☐ Fail

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 03004786 Calibration date 23/02/2021

3. HEPA filter leak test.

Measurement Data

HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	18 $\mu\text{g/L}$	<0.003%	<0.003%
Exhaust HEPA Filter	18 $\mu\text{g/L}$	<0.003%	<0.003%

Certificate No. : M0979/21

Leak location

Supply HEPA Filter

Back



Exhaust HEPA Filter

Back



Result Summary ☒ Pass ☐ Fail

Equipment used : Aerosol Photometer Model TDA-2H S/N : 21683 Calibration date 24/02/2021

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

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. : M0979/21

Result Summary

Downflow Pattern test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
View screen retention test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
Work opening edge retention test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
Sash/window seal test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming

5. Site Installation

Sash Alarm.	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
Interlock System.	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
Exhaust System Performance	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A

Remark / Recommendation

ระบบ 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

632	1000	997	630
947	1456	1449	921

Remark :

Certificate No. : M0979/21

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

740	1580	1570	750
480	1040	1020	480

Remark :

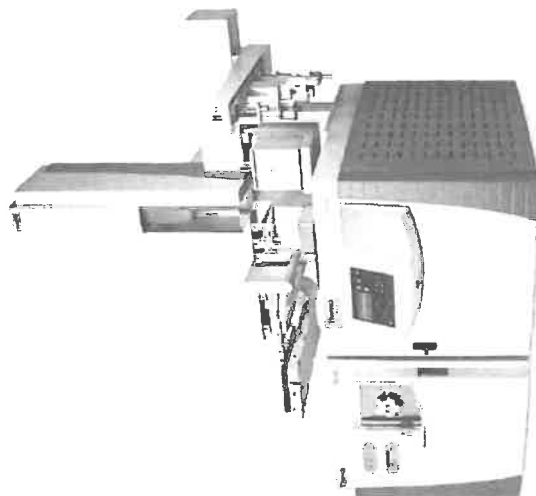
-000-

1. Customer Data.

Company	บริษัท ฟูเออร์ไบโอสาย=สินค้า อ้าด้อย
Customer name	คุณ ภาณุพงศ์ อ้าด้อย
Department	LAB / 3rd Floor
Address/City	1/94 หมู่ 5 ต.บ้านใหม่ อ.เมือง จ.อยุธยา 13210
Telephone	035-800-593
Fax / E-Mail	035-800-594
Contract number	1019110115

2. Instrument Data (include optional accessories).

Instrument /Accessory:	Serial Number:
ISQ 7000	I8Q 71908002
Trace 1300	719101474
TriPlus 100 LS	487727
Edwards RV3	190279210
PET Atom X X42	US19270017



Preventive Maintenance for GCMS ISQ Series

PREVENTIVE MAINTENANCE CHECKLIST

3. Instrument Software.

Data System Software and Version	Chromleon 7.2.10
----------------------------------	------------------

4. Service Report.

Job Number	2019121013
------------	------------

PREVENTIVE MAINTENANCE CHECKLIST

5. Special Instructions.



Points to remember whilst carrying out preventative maintenance:

1. Wear gloves and goggles at all times when handling oils and solvents.
 2. Wear gloves and eye protection at all time during handling liquid Nitrogen.
 3. Exercise caution when handling hot parts.
 4. Observe appropriate chemical disposal requirements.
 5. Check with customer if there are any contaminated parts which may need careful handling.
 6. If returning faulty pump(s) for repair, make sure you send a signed 'disclaimer form' with it. Pump(s) will **NOT** be accepted otherwise.
 7. Run through this checklist with customer and show work carried out and parts replaced.
 8. Inform the customer that Thermo does not take any responsibility for loss of data in any storage device / computer system. Make sure that the customer made a backup of all Data before you start the PM.
 9. Any Special instructions needed for the specific instrument.
- FINALLY**, inform the customer of any changes you may have made to software or hardware settings during your visit.

6. Initial Checks by Customer

- ☒ Is all Data on the Storage Devices Backed up? SciSpec takes no responsibility for any loss of Data.
- ☒ Make sure all glassware has been cleaned of all hazardous material before PM

PREVENTIVE MAINTENANCE CHECKLIST

7. Initial Checks by Service Engineer

GC,MS,Data system should be work well before starting PM

Item	Done	Not done	N/A
Check electronics: diagnostics, voltages	✓		
Check system communication all of GC,MS, Auto sampler	✓		
Remove the dust from the boards and fan	✓		
Update firmware if necessary (GC & AS)		✓	

8. GC Oven Temperature Accuracy Test

Test Instruction

- Place the temperature probe in the column oven within 1 cm of the oven sensor.
- Close column oven.
- Set the GC oven temperature to 40.0 °C.
- Allow the temperature to stabilize, record the set (GC front panel) and measured (thermometer) oven temperature on the Column Oven Temperature table.
- Set the GC oven temperature to 120.0 °C.
- Allow the temperature to stabilize, record the set (GC front panel) and measured (thermometer) oven temperature on the Column Oven Temperature table.

Oven Temperature Test				
Description	Set temperature	Observed Temperature	Applicable	Action
Temperature Reading (Limit $\pm 1^\circ\text{C}$)	40°C	40.1 °C	✓	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
Temperature Reading (Limit $\pm 2^\circ\text{C}$)	120°C	120.3 °C	✓	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

PREVENTIVE MAINTENANCE CHECKLIST

9. GC Inlet Temperature and Leak Test

SSL Inlet Temperature Test Instruction

- Inlet temperature may be measured through the top or bottom of Inlet.
- To measure through the bottom of Inlet.
: Remove capillary adapter and Inlet liner, if installed.
- To measure through the top of Inlet.
: Remove the septa holder and Inlet liner, if installed.
- Insert the thermocouple probe inside the Inlet.
- Set appropriate SSL Inlet temperature to 100°C.
- Allow temperature to equilibrate.
- Record the set (GC front panel or software) and measured (Thermometer display) Inlet temperatures on the table.

Inlet Temperature Test				
Description	Set temperature	Observed Temperature	Applicable	Action
Channel1 Front Temperature Reading (Limit $\pm 5^\circ\text{C}$)	100°C	99.8 °C	✓	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
Channel2 Back Temperature Reading (Limit $\pm 5^\circ\text{C}$)	100°C	99.7 °C	✓	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

PTV Inlet Temperature Test Instruction

- Inlet temperature may be measured through the top or bottom of Inlet.
- To measure through the bottom of Inlet.
: Remove capillary adapter and Inlet liner, if installed.
- To measure through the top of Inlet.
: Remove the septa holder and Inlet liner, if installed.
- Insert the thermocouple probe inside the Inlet.
- Set appropriate SSL Inlet temperature to 100°C.
- Allow temperature to equilibrate.
- Record the set (GC front panel or software) and measured (Thermometer display) Inlet temperatures on the table.

Inlet Temperature Test				
Description	Set temperature	Observed Temperature	Applicable	Action
Channel1 Front Temperature Reading (Limit $\pm 5^\circ\text{C}$)	100°C	N/A		<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
Channel2 Back Temperature Reading (Limit $\pm 5^\circ\text{C}$)	100°C	N/A		<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

PREVENTIVE MAINTENANCE CHECKLIST

Inlet Leak Test Instruction

1. With the GC powered ON, Set the initial oven temperature to 40°C, keeping the door open.
2. Insert an aluminum plug in to the M4 capillary Inlet. Attached the nut to the capillary inlet and tighten.
3. Install a new, unused septa and seal with the septa nut.
4. Set the following for the tested inlet.
 - : Inlet constant pressure at 200kPa.
 - : Splitless Mode.
 - : Split flow to 50 mL/min.
 - : Constant septum purge to Yes.
5. Turn the Inlet pressure ON.
6. Turn of the split vent valve and the septum purge valve.
7. Allow the Inlet pressure to equilibrate
8. Record the time and the pressure in the table.
9. Set the Inlet pressure to OFF.
10. Wait three minutes.
11. Record the pressure observes after three minutes in the table.

Inlet Leak Test				
Description	Set pressure	Observed pressure after three minutes	Not Applicable	Action
Channel1 Front Pressure Reading (Limit ≤10kPa)	200 kPa	199.0 kPa	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
Channel2 Back Pressure Reading (Limit ≤10kPa)	200 kPa	193.4 kPa	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

PREVENTIVE MAINTENANCE CHECKLIST

10. GC Inlet Flow Test
Inlet Flow Test Instruction

1. Turn ON the Inlet pressure and configure Inlet for:
 - : Splitless injection.
 - : Split flow 60 mL/min.
 - : Constant flow mode.
 - : Flow to 5 mL/min.
2. Configure the appropriate Carrier to:
 - : Constant pressure mode.
 - : Carrier gas pressure to 125 kPa
3. Turn ON the split and septum purge valve.
4. Attach flow meter to split vent measuring port and allow flow to stabilize.
5. Record the split vent flow value on table.
6. Configure the appropriate carrier to:
 - : Constant pressure mode.
 - : Carrier gas pressure to 125 kPa
7. Attach flow meter to septum purge measuring port and allow flow to stabilize.
8. Record the septum purge flow value on table.
9. Remove the flow measuring adapter and return the system to its.

Inlet Split Flow Test				
Description	Set Flow	Observed Flow	Not Applicable	Action
Channel1 Front Split Flow Reading (Limit ±5 mL/min)	60 mL/min	62.8 mL/min	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
Channel2 Back Split Flow Reading (Limit ±5 mL/min)	60 mL/min	57.2 mL/min	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

Inlet Septum Purge Flow Test				
Description	Set Flow	Observed Flow	Not Applicable	Action
Channel1 Front Septum Purge Flow Reading (Limit ±2 mL/min)	5 mL/min	5.1 mL/min	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
Channel2 Back Septum Purge Flow Reading (Limit ±2 mL/min)	5 mL/min	5.0 mL/min	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

11. ISQ pressure values before Starting PM

1. Set the Ion Source & Transfer line Temperature to 200 °C.
2. Record the following readback values before starting the PM.

Readback	Value
Dashboard Status	Idle
MS transfer line temp	250 °C
Ion source temp	200 °C
Vacuum	<input checked="" type="checkbox"/> OK <input type="checkbox"/> Not OK
Foreline pressure	85 mTorr
Ion gauge pressure	4.9E-006 Torr
Turbo-pump speed	100 %

11.1 LED Status before starting PM

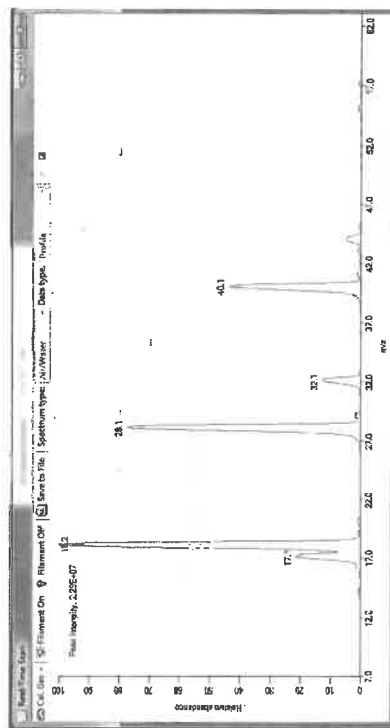
1. Set the instrument to On mode.
2. Confirm that the all interlocks are closed.
3. Check that the following LEDs display normal status. Record the results in the following table.

LED Location	Normal LED Status	Pass	Fail
Power	Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Vacuum	Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Heater	Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Busy	Blue	<input checked="" type="checkbox"/>	<input type="checkbox"/>

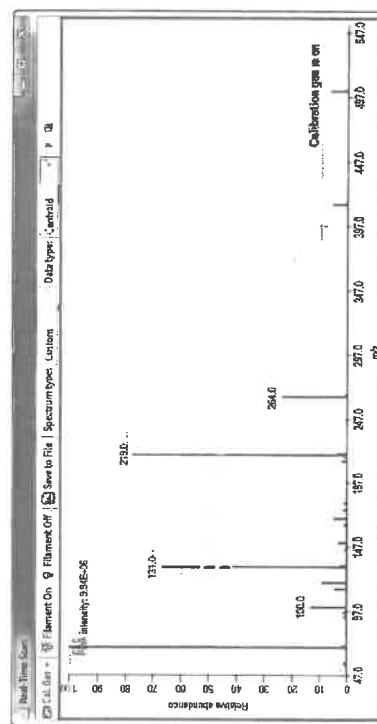
11.2 Readback Status before Starting

1. Open Dashboard and run full Diagnostics.
2. Save full diagnostics & print ISQ Tune result.

11.3 Check Air water and Confirm Ion Beam is Present Check Air/ water

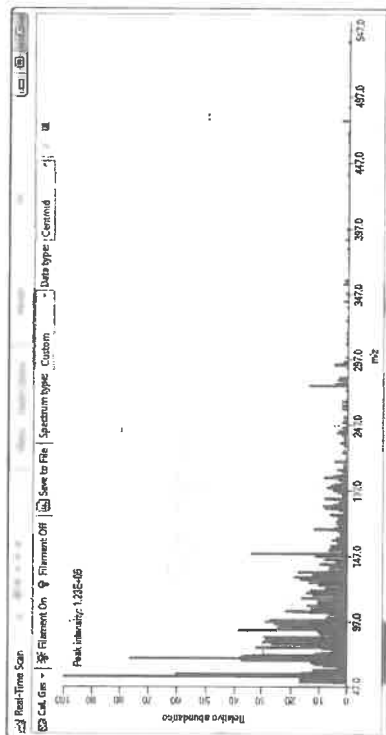


Check FC- 43 In EI mode



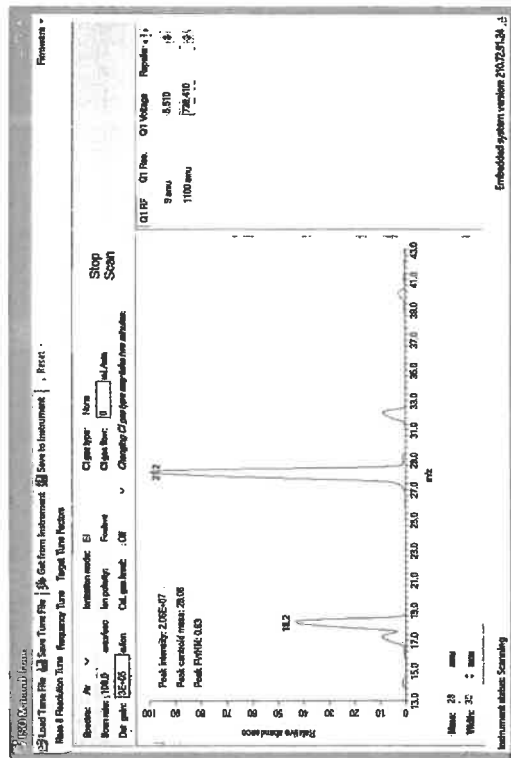
PREVENTIVE MAINTENANCE CHECKLIST

Check background by full scan 50-650 amu in EI mode

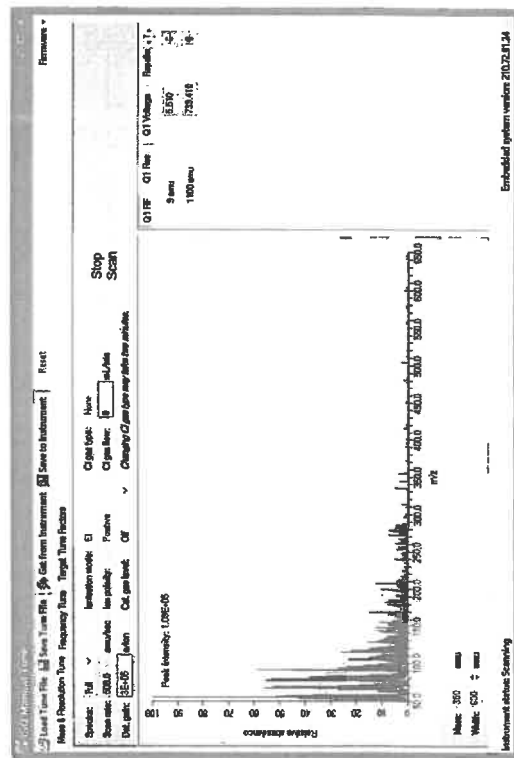


Note. Use lint-free and powder free gloves to handle all analyzer components. Place all analyzer components on a clean lint free surface.

Air/Water



Background



PREVENTIVE MAINTENANCE CHECKLIST

12. Work to be done

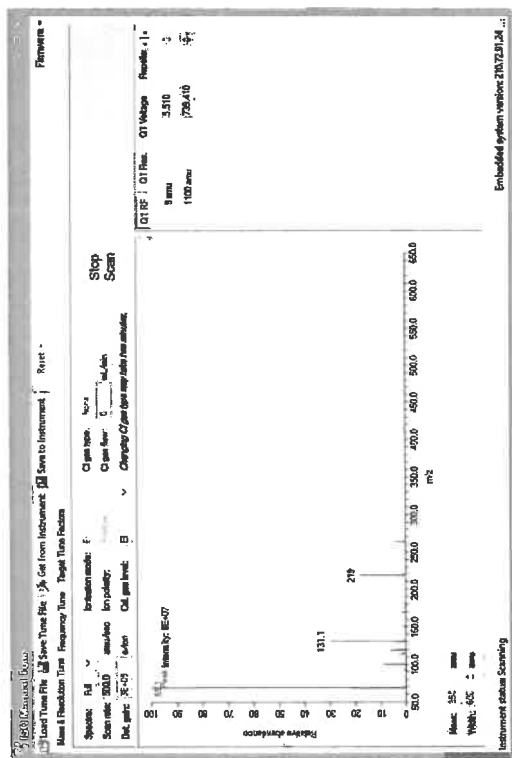
Vacuum Pump:

Description	Applicable	Not Applicable	Action
1. Replace the oil of the RV3.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not Done
2. Inspect and clean the inlet-filter of the RV3.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not Done
3. Clean the motor fan-cover and enclosure of the RV3.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not Done

Fans:

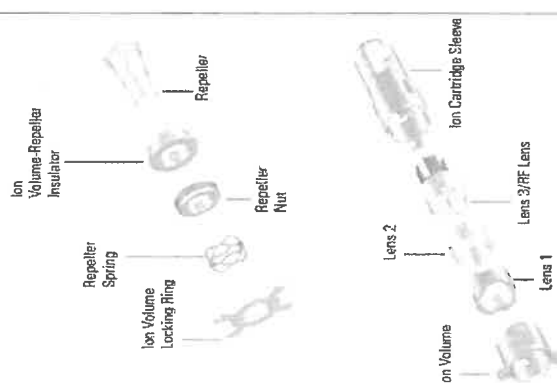
Description	Applicable	Not Applicable	Action
1. Inspect and cleaning all fans.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not Done
2. Wash the air filters with water. Allow the filters to dry before they are reinstalled in the instrument.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not Done

Cal Gas



El/CI Probe and Ion Source:

PREVENTIVE MAINTENANCE CHECKLIST

Description	Applicable	Not Applicable	Action
Remove and clean ion source. Ion volume, L1, L2, L3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
			

PREVENTIVE MAINTENANCE CHECKLIST

13. Checks by Service Engineer after PM finished.

13.1 ISQ pressure values After PM.

- Set the Ion Source & Transfer line Temperature to 200 °C.
- Record the following readback values before starting the PM.

Readback	Value
Dashboard Status	IDLE 250 Whan
MS transfer line temp	250 °C
Ion source temp	220 °C
Vacuum	<input checked="" type="checkbox"/> OK <input type="checkbox"/> Not OK
Foreline pressure	80 mTorr
Ion gauge pressure	4.7E-06 Torr
Turbo-pump speed	100 %

13.2 LED Status.

- Set the instrument to On mode.
- Confirm that the all interlocks are closed.
- Check that the following LEDs display normal status. Record the results in the following table.

LED Location	Normal LED Status	Pass	Fail
Power	Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Vacuum	Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Heater	Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Busy	Blue	<input checked="" type="checkbox"/>	<input type="checkbox"/>

13.3 Readback Status before Starting

- Open Dashboard and run full Diagnostics.
- Save full diagnostics & print ISQ Tune result.

PREVENTIVE MAINTENANCE CHECKLIST

13.4 Measurement and Calibration.

Description	Applicable	Not Applicable	Action
1. Check air/water spectrum	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not Done
2. Check spectrum between 50 - 650amu on EI	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not Done
3. Check high mass background	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not Done
4. Run autotune EI mass calibration and detector gain	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not Done
5. Print the following documents and attach the documents to this PM checklist	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not Done

PREVENTIVE MAINTENANCE CHECKLIST

14. Final Report.

Description	Applicable	Not Applicable	Action
Electron Ionization with ISQ Signal to Noise Test Injections 1 ul of 1 pg/ul octafluoronaphthalene (OFN) standards are injected into GC/MS system. The data are collected and evaluated to 272 when scanning 50-300Da for the signal-to-noise ratio at each resolution. S/N = 600: 1 S/N = <u>N/A</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not Done
Discuss with the customer any remaining problems with the instrument, and any problems likely to arise in the near future. Fill out the paperwork and leave the customers copy along with the completed check list sheet.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not Done

PREVENTIVE MAINTENANCE CHECKLIST

15. Auto-Sampler calibration.

Triplus BSH 100 LS

Calibration for the sample tray position accuracy.

Tray 1 Position calibration.			Applicable	Not Applicable	Action
VT54	R60	Other.....			
<input checked="" type="checkbox"/> Position 1	<input type="checkbox"/> Position 1	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
<input checked="" type="checkbox"/> Position 46	<input type="checkbox"/> Position 10	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
<input checked="" type="checkbox"/> Position 54	<input type="checkbox"/> Position 60	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

Tray 2 Position calibration.			Applicable	Not Applicable	Action
VT54	R60	Other.....			
<input checked="" type="checkbox"/> Position 1	<input type="checkbox"/> Position 1	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
<input checked="" type="checkbox"/> Position 46	<input type="checkbox"/> Position 10	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
<input checked="" type="checkbox"/> Position 54	<input type="checkbox"/> Position 60	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

Tray 3 Position calibration.			Applicable	Not Applicable	Action
VT54	R60	Other.....			
<input checked="" type="checkbox"/> Position 1	<input type="checkbox"/> Position 1	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
<input checked="" type="checkbox"/> Position 46	<input type="checkbox"/> Position 10	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done
<input checked="" type="checkbox"/> Position 54	<input type="checkbox"/> Position 60	<input type="checkbox"/> Position.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

PREVENTIVE MAINTENANCE CHECKLIST

Triplus RSH(Continued)

Calibration for the sample tray position accuracy.

Tray 4 Position calibration.			Applicable	Not Applicable	Action
VT54	R60	Other.....			
<input type="checkbox"/> Position 1	<input type="checkbox"/> Position 1	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done
<input type="checkbox"/> Position 46	<input type="checkbox"/> Position 10	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done
<input type="checkbox"/> Position 54	<input type="checkbox"/> Position 60	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done

Tray 5 Position calibration.			Applicable	Not Applicable	Action
VT54	R60	Other.....			
<input type="checkbox"/> Position 1	<input type="checkbox"/> Position 1	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done
<input type="checkbox"/> Position 46	<input type="checkbox"/> Position 10	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done
<input type="checkbox"/> Position 54	<input type="checkbox"/> Position 60	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done

Tray 6 Position calibration.			Applicable	Not Applicable	Action
VT54	R60	Other.....			
<input type="checkbox"/> Position 1	<input type="checkbox"/> Position 1	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done
<input type="checkbox"/> Position 46	<input type="checkbox"/> Position 10	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done
<input type="checkbox"/> Position 54	<input type="checkbox"/> Position 60	<input type="checkbox"/> Position.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Done <input type="checkbox"/> Not done

PREVENTIVE MAINTENANCE CHECKLIST

TriPlus RS8 (Continued) 100 LS

Calibration for the Inlet position accuracy.

Injector 1		Applicable	Not Applicable	Action
X Value	Y Value	Z Value		
410.6 mm	218.2 mm	460.9 mm	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

Injector 2		Applicable	Not Applicable	Action
X Value	Y Value	Z Value		
410.0 mm	120.3 mm	451.0 mm	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

Calibration for the Wash station position accuracy.

Wash Station		Applicable	Not Applicable	Action
X Value	Y Value	Z Value		
108.8 mm	116.6 mm	299.1 mm	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

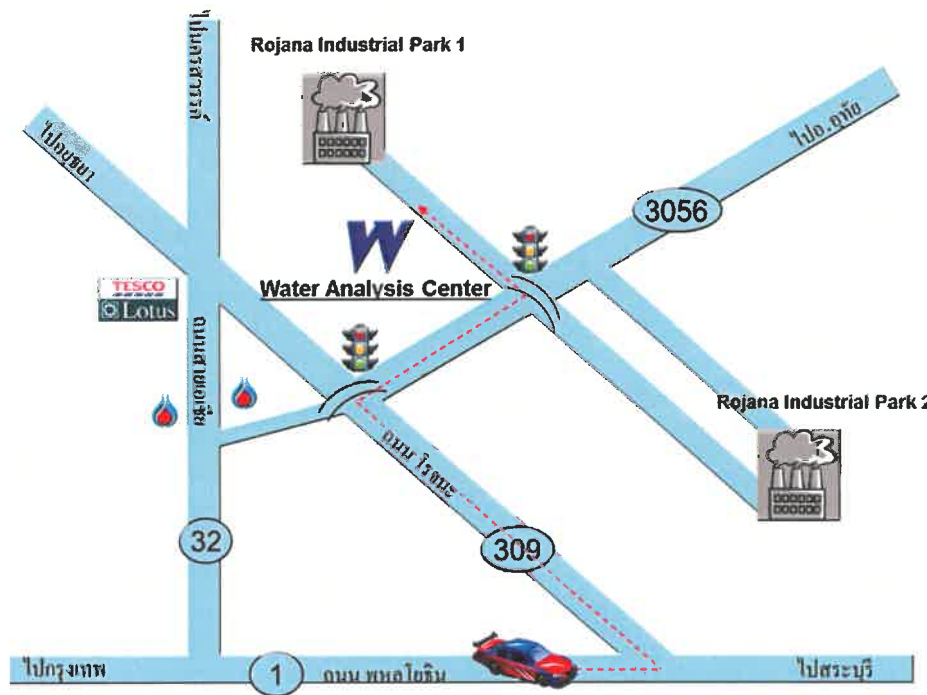
Calibration for the Agitator position accuracy.

Agitator		Applicable	Not Applicable	Action
X Value	Y Value	Z Value		
N/A	N/A	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

Calibration for the Fiber condition position accuracy.

Fiber condition		Applicable	Not Applicable	Action
X Value	Y Value	Z Value		
N/A	N/A	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done

Description	Applicable	Not Applicable	Action
Re-grease the parts with the dedicated grease for the TriPlus RS8.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Done <input type="checkbox"/> Not done



บริษัท ศูนย์วิเคราะห์น้ำ จำกัด

1/94 หมู่ที่ 5 ต.คานหาม อ.อุทัย จ.พระนครศรีอยุธยา 13210

โทรศัพท์ 035-800593, 081-9917119 โทรสาร 035-800594

Email : wac@wacthai.com Website : www.wacthai.com