

เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัด

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม

| รายการตรวจวัด | เครื่องมือเก็บตัวอย่าง | เครื่องมือตรวจวิเคราะห์ |
|---|---|-------------------------|
| | ชื่อเครื่องมือ | ชื่อเครื่องมือ |
| คุณภาพอากาศในบรรยากาศโดยทั่วไป ก๊าซไฮโดรคาร์บอน | THC Analyzer No. R01 | THC Analyzer No. R01 |
| ระดับเสียงโดยทั่วไป ระดับเสียงเฉลี่ย 24 ชั่วโมง (L_{eq} 24 hr) ระดับเสียงเฉลี่ย 8 ชั่วโมง (L_{eq} 8 hr) ระดับเสียงสูงสุด (L_{max}) ระดับเสียงกลางวัน-กลางคืน (L_{dn}) ระดับเสียงเปอร์เซ็นต์ไทล์ที่ 90 (L_{90}) | Acoustic Calibration Sound Level Meter No. ACO-B32 | - |
| คุณภาพน้ำ อุณหภูมิ | - | Thermometer |
| ความเป็นกรด-ด่าง | - | pH Meter |
| ความขุ่น | - | Turbidity Meter |
| สารแขวนลอย | - | Digital Balance |
| น้ำมันและไขมัน | - | Digital Balance |
| บีโอดี | - | BOD Analyzer |
| ซีโอดี | - | COD Analyzer |
| สารอินทรีย์ระเหยง่าย | - | GC/MS |
| คุณภาพดิน สารอินทรีย์ระเหยง่าย | - | GC/MS |

เอกสารแนบที่ ง-1

คุณภาพอากาศในบรรยากาศโดยทั่วไป



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Calibration Report
Total Hydrocarbon Analyzer

Date : 02 November 2022 Brand : HORIBA Model : APHA-370
No. R01 Serial No. WDDDN38N

Calibrator (Dilution System)

Brand : API Model : 700
Last Cal. Date : 04 August 2022 Serial No. : 911

Reference Standard Gas

Standard Gas : Methane (CH₄) Cylinder No. : D595075
Certified Date : 17 March 2015 Expired Date : 17 March 2023 Cylinder Conc. : 456 ppm

Calibrating Condition

Pressure 1011 mmbar Temp. 24.6 °C % RH 48
Start Time : 10:00 AM

Pre-Calibration Checks

Change Particulate Filter Yes Station Temp : 25.0 °C
Leak Test Yes

Calibration Setting

| Span Set Point | Initial Reading (Before Adj) | | Final Reading (After Adj) |
|----------------|------------------------------|-------------------------|---------------------------|
| | Expected Concentration (PPM) | Analyzer Response (PPM) | Analyzer Response (PPM) |
| Zero | 0 | -0.10 | 0 |
| Span | 10 | 10.02 | 10 |

Calibration Setting (Final)

Span Instrument Gain: 0.998 Finish Time: 11:00 AM

APHA-360 Total Hydrocarbon Analyzer

| Test Values | Observed Value | Units | Nominal Range |
|---------------------------|----------------|---------|--------------------------------------|
| Signal (CH ₄) | 912.1 | mV | 800-1,350 |
| Signal (THC) | 917.6 | mV | 800-1,350 |
| Detector | 78.0 | kPa | ((Pressure Air/1013)x100)-20 ± 4 kPa |
| Purifier | 19.1 | kPa | 8 - 25 |
| NMC | 259.8 | °C | 260 ± 10 |
| Bypass | 0.9 | L / min | 0.9 ± 0.3 |
| Over Flow | 0.8 | L / Min | 0.8 |

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

เอกสารแนบที่ ง-2
ระดับเสียงโดยทั่วไป

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0455

MTC No. EEL. BP. 41/0465

CALIBRATION CERTIFICATE

Submitted by : S.P.S. Consulting Service Co.,Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

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

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 22 Apr. 2022

Date of Calibration : 28 Apr. 2022

N.1.2

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.

FM.BL.MTC.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 : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory
Soi 1C, 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 1121-30 ext. 5219, 5225, 5217
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0455

MTC No. EEL. BP. 41/0465

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

| Standard Microphone Type | Measured Sound Pressure Level (dB) | Deviated value (dB) | Uncertainty (dB) | Tolerance limit IEC60942:2003 Class 1 |
|---------------------------|------------------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 93.93 | -0.07 | ± 0.10 | ± 0.40 dB |

2. Frequency

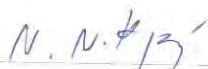
| Standard Microphone Type | Measured Frequency (Hz) | Deviated value (Hz) | Uncertainty (Hz) | Tolerance limit IEC60942:2003 Class 1 |
|---------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 999.9 | -0.1 | ± 1.5 | $\pm 1.0\%$ |


3. Total Distortion

| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 1 |
|---------------------------|-------------------------------|-----------------|---------------------------------------|
| 1/2 inch Bruel&Kjaer 4180 | 1.44 | ± 0.50 | $\pm 3.0\%$ |

- Note :
1. No adjustment.
 2. The calibrator pressure correction was not included.
 3. The microphone volume correction was not included.

Calibrated by :


(Mr. Nuttapong Niljrusvanit)


(Mr. Tawikiat Iamsamran)

Date of Calibration : 28 Apr. 2022

Date of Issue : 28 Apr. 2022

Approved by :


(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011265042601787001

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End of Certificate

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

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FM.BL.MTC.002 Rev.4

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Thailand
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Noise B_604/22

Sound Level Meter Calibration Report

Acoustic Calibrator Data

| | | | |
|-------------------|----------------|------------------|---------------|
| Brand | ACO | Number | AC 03/56 |
| Model | 2127 | Serial No. | 130006 |
| Calibration Range | 94 dB, 1000 Hz | Last Calibration | 28 April 2022 |
| | | Due Date | 28 April 2023 |

Calibration Data

| Sound Level Meter Data | | | | Calibration Data | | |
|--|-------|-------|------------|------------------|---------------------|------------------|
| SLM No. | Brand | Model | Serial No. | Date | Actual Reading [dB] | |
| | | | | | Before Adjustment | After Adjustment |
| ACO-B32 | ACO | 6236 | 00182014 | 02 November 2022 | 94.1 | 94.0 |
| Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR) | | | | | 93.93 ± 0.10 dB | |

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

เอกสารแนบที่ ง-3

คุณภาพน้ำ

Certificate of Calibration

Certificate No. : 65-400210-1

Page : 1 of 2

Submitted by : S. P. S Consulting Service Co.,Ltd.
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Equipment : Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

Environment : Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 19 April 2022

Date of Calibration : 23 April 2022

Date of Issue : 23 April 2022

Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

| ID No. | Cert. No. | Due Date | Traceability |
|--------|------------|-------------|---|
| 400001 | TT-0016-22 | 07 Feb 2024 | National Institute of Metrology Thailand (NIMT) |

2. Standard Digital Thermometer

| ID No. | Cert. No. | Due Date | Traceability |
|--------|-----------|-------------|---|
| 400003 | 21E1850 | 14 Jun 2023 | National Institute of Metrology Thailand (NIMT) |
| 400004 | 21E1850 | 14 Jun 2023 | National Institute of Metrology Thailand (NIMT) |

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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www.calibratech.co.th

Certificate of Calibration

Certificate No. : 65-400210-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC* reading 0 °C Standard reading 0.6439 °C

| Standard Reading (°C) | UUC Reading (°C) | Correction (°C) | Uncertainty (± °C) |
|----------------------------|-----------------------|----------------------|-------------------------|
| 20.6690 | 20 | 0.7 | 0.31 |

Remark

UUC : Unit Under Calibration

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

This 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%

- o0o -

B✓



**QUALITY CALIBRATION CO.,LTD.**

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

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



CERTIFICATE No : 22E9693

REFERENCE No : 66476-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER

MANUFACTURER : HANNA

MODEL : HI 3512

SERIAL No : TH118035

ID No : pH 04/56

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 15-Sep-22

APPROVED BY : PONGSAK J.

ISSUED DATE : 15-Sep-22

RECEIVED DATE : 14-Sep-22

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

**QUALITY CALIBRATION CO.,LTD.**

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CERTIFICATE No : 22E9693

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : HANNA
ID No : pH 04/56
RECEIVED DATE : 14-Sep-22
AMBIENT TEMPERATURE : 20 ° C ± 1 ° C

MODEL : HI 3512
SERIAL NUMBER : TH118035
CALIBRATION DATE : 15-Sep-22
RELATIVE HUMIDITY : 50 % RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

| <u>INSTRUMENT</u> | <u>MODEL</u> | <u>SERIAL No/ LOT No</u> | <u>CERTIFICATE No</u> | <u>DUE DATE</u> |
|---------------------------|--------------|------------------------------|-----------------------|-----------------|
| 1) pH STANDARD SOLUTION | 00651-06 | CC719181 | 4880-12119147 | 05-Apr-23 |
| 2) pH STANDARD SOLUTION | 00651-08 | CC718727 | 4881-12110709 | 31-Mar-23 |
| 3) pH STANDARD SOLUTION | 00651-10 | CC717045 | 4882-12065386 | 17-Mar-23 |
| 4) PROCESS CALIBRATOR | CA150 | 91S6079 | 22E1145 | 31-Mar-23 |
| 5) BATH | 260014 | 1247 48074 | 22T9870 | 13-Sep-23 |
| 6) THERMOMETER WITH PROBE | 421504 | 55000379 | 22T9904 | 13-Sep-23 |

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

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

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

| mV APPLIED | UUC READING (mV) | CORRECTION (mV) | UUC READING (pH) | UNCERTAINTY OF MEASUREMENT (± mV) | COVERAGE FACTOR k |
|---------------|---------------------|--------------------|---------------------|---|-------------------------|
| 414.11 | 414.8 | -0.69 | -0.171 | 0.14 | 2.0 |
| 354.95 | 355.6 | -0.65 | 0.860 | 0.14 | 2.0 |
| 295.80 | 296.4 | -0.60 | 1.892 | 0.14 | 2.0 |
| 236.64 | 237.2 | -0.56 | 2.922 | 0.14 | 2.0 |
| 177.48 | 178.0 | -0.52 | 3.954 | 0.14 | 2.0 |
| 118.32 | 118.8 | -0.48 | 4.985 | 0.14 | 2.0 |
| 59.16 | 59.7 | -0.54 | 6.016 | 0.14 | 2.0 |
| 0.00 | 0.5 | -0.50 | 7.049 | 0.14 | 2.0 |
| -59.16 | -58.8 | -0.36 | 8.136 | 0.14 | 2.0 |
| -118.32 | -117.9 | -0.42 | 9.223 | 0.14 | 2.0 |
| -177.48 | -177.1 | -0.38 | 10.311 | 0.14 | 2.0 |
| -236.64 | -236.3 | -0.34 | 11.399 | 0.14 | 2.0 |
| -295.80 | -295.5 | -0.30 | 12.487 | 0.14 | 2.0 |
| -354.95 | -354.7 | -0.25 | 13.575 | 0.14 | 2.0 |
| -414.11 | -413.9 | -0.21 | 14.662 | 0.14 | 2.0 |

END OF CALIBRATION REPORT PAGE 2 OF 3

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CERTIFICATE No : 22E9693

PAGE : 3 OF 3

Calibration Report**RESULT OF CALIBRATION (CONTINUE) :****2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M**

| STANDARD pH BUFFER SOLUTION (pH) | UUC READING (pH) | CORRECTION (pH) | VALUE BEFORE ADJUSTMENT | UNCERTAINTY OF MEASUREMENT (± pH) | COVERAGE FACTOR k |
|--|---------------------|--------------------|-------------------------------|---|-------------------------|
| 4.007 | 4.007 | 0.000 | 3.996 | 0.012 | 2.0 |
| 7.004 | 7.006 | -0.002 | 6.944 | 0.012 | 2.0 |
| 10.016 | 10.012 | 0.004 | 10.194 | 0.014 | 2.0 |

3. DISPLAY UNIT WITH TEMPERATURE

| STANDARD READING (°C) | UUC READING (°C) | CORRECTION (°C) | VALUE BEFORE ADJUSTMENT | UNCERTAINTY OF MEASUREMENT (± °C) | COVERAGE FACTOR k |
|-----------------------------|---------------------|--------------------|-------------------------------|---|-------------------------|
| 25.003 | 25.0 | 0.003 | --- | 0.0085 | 2.0 |

4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 21CH1216

Page.: 1 of 2

Certificate of Calibration

| | |
|-------------------------|---|
| Equipment : | pH Meter |
| Manufacturer : | HANNA |
| Model : | HI 3512 |
| Serial No. : | 08685754 |
| ID No. : | - |
| Condition As-Received: | Used Item |
| Received Date : | 14 September 2021 |
| Calibration Date : | 16 September 2021 |
| Reference : | 2109-0508WN-1 |
| Submitted by : | S.P.S. Consulting Service Co.,Ltd. 7 Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok10900 |
| Ambient Temperature : | (25 ± 2.5) °C |
| Relative Humidity : | (50 ± 15) % |
| Calibration Procedure : | In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) |

Calibrated by : Walalak Sirithean

Approved by :

Approved Signatory

- (✓) Malee Butkruea
() Saithip Meangmai
() Warakorn Lernagtrakul

Issue Date : 22 September 2021

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0032410



Cert. No.: 21CH1216

Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument : -

| <u>Instrument</u> | <u>Serial No.</u> | <u>ID No.</u> | <u>Cert. No.</u> | <u>Due Date</u> |
|--------------------------------|-------------------|---------------|------------------|-----------------|
| 1) Document Process Calibrator | 46530031 | 130RC098 | 20E3666 | 14 Oct 2021 |

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

| <u>Buffer Solution</u> | <u>Manufacturer</u> | <u>Lot No.</u> | <u>Exp. date</u> |
|------------------------|---------------------|----------------|------------------|
| pH 4.008 | CPA chem | 754028 | 28 June 2023 |
| pH 6.985 | CPA chem | 725927 | 12 Jan 2022 |
| pH 10.015 | CPA chem | 761018 | 02 Aug 2022 |

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results**Function : mV Measurement****Performing standard curve by Fluke at pH (4,7,10)**

| Unit Under Calibration | Nominal Value | Standard Voltage Input | Actual Reading | | Uncertainty of Measurement (\pm mV) | Coverage factor <i>k</i> |
|----------------------------|---------------|------------------------|----------------|--------|---|-----------------------------|
| | pH | mV | mV | pH | | |
| pH Meter S/N.: 08685754 | 4.000 | 177.48 | 177.9 | 4.000 | 0.058 | 2.00 |
| | 7.000 | 0.00 | 0.4 | 7.000 | 0.058 | 2.00 |
| | 10.000 | -177.48 | -177.2 | 10.000 | 0.058 | 2.00 |

Function : pH Measurement**Performing three buffers standard curve by using buffer nominal pH (4,7,10)**

| Unit Under Calibration | Standard pH Buffer Solution | Actual pH Reading | Actual mV Reading (mV) | Uncertainty of pH measurement (\pm) | Coverage factor <i>k</i> |
|--------------------------------|-----------------------------|-------------------|---------------------------|--|-----------------------------|
| pH Electrode S/N.: 061416CM | 4.008 | 4.008 | 169.2 | 0.0046 | 2.00 |
| | 6.985 | 6.985 | -4.4 | 0.0075 | 2.00 |
| | 10.015 | 10.013 | -178.9 | 0.013 | 2.05 |

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CALIBRATION AND TESTING EQUIPMENT SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000-24 FAX. 0-2719-9484

Cert.No.: 22CH578

Page.: 1 of 2

Certificate of Calibration

Equipment : Turbidity Meter
Manufacturer : Eutech
Model : Cyberscan WL TB1000
Serial No. : 201802206
ID. No. : TB 03/61
Condition As-Received: Used Item
Received Date : 25 April 2022
Calibration Date : 27 April 2022
Reference : 2204-0619WN-1
Submitted by : S.P.S. Consulting Service Co.,Ltd.
7 Phaholyothin 24, Phaholyothin Road.,
Jompol, Chatuchak, Bangkok 10900
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 20) %
Calibration Procedure : In - house method : CP-CH11
based on direct measurement by
using Formazin standard solution

Calibrated by : Walalak Sirithean

Approved by :

Approved Signatory

- (☒) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 3 May 2022

The Uncertainties are for a confidence probability of approximately 95%.

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration and Testing Equipment Services.

A 0008721



Cert.No. : 22CH578

Page. : 2 of 2

Condition of this calibration result

1. Reference Standard Instruments :

This certification is traceable to the International System of unit (SI unit) through Technology Promotion Association (Thailand-Japan).

| <u>Instruments</u> | <u>Serial No.</u> | <u>ID No.</u> | <u>Certificate No.</u> | <u>Due date</u> |
|-----------------------|-------------------|---------------|------------------------|-----------------|
| 1) Thermo-Hygrograph | 1102794 | 130EC009 | 21H2601 | 8 Dec 2022 |
| 2) Electronic Balance | N03679 | 140RC001 | 21MM429 | 21 Sep 2022 |

2. Standard Material : The Formazin suspension has been prepared gravimetric from

| <u>Material</u> | <u>Manufacturer</u> | <u>Lot No.</u> | <u>Assay</u> |
|---------------------------|---------------------|----------------|--------------|
| 1) Hexamethylenetetramine | HIMEDIA | 0000493947 | 99.65% |
| 2) Hydrazinium Sulfate | HIMEDIA | 0000522014 | 99.40% |

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration result

Performing three - Formazin suspension standard curve by using 0,10,1000 NTU
Turbidity Meter Serial Number : 201802206

| Standard Formazine suspension (NTU) | UUC* Reading (NTU) | Uncertainty of Measurement (\pm NTU) | Coverage Factor <i>k</i> |
|---|-------------------------|--|--------------------------------|
| 20 | 19.4 | 0.38 | 2.00 |
| 40 | 39.3 | 0.40 | 2.00 |
| 100 | 98.9 | 0.73 | 2.00 |
| 400 | 389 | 1.5 | 2.00 |

Remark

- UUC* = Unit Under Calibration
- NTU = Nephelometric Turbidity Units

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

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CERTIFICATE No : 22M2569

REFERENCE No : 64386-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : TETNITHI W.

CALIBRATION DATE : 11-Mar-22

APPROVED BY : PONGSAK J.

ISSUED DATE : 17-Mar-22

RECEIVED DATE : 11-Mar-22



CERTIFICATE No : 22M2569

PAGE : 2 OF 2

Calibration Report

| | | | | | |
|---------------------|---|----------------------|-------------------|---|----------------------|
| EQUIPMENT | : | DIGITAL BALANCE | MODEL | : | BSA224S-CW |
| MANUFACTURER | : | SARTORIUS | S/N | : | 36591843 |
| ID No | : | BA 09/61 | RECEIVED DATE | : | 11-Mar-22 |
| AIR PRESSURE | : | 1008mbar \pm 1mbar | CALIBRATION DATE | : | 11-Mar-22 |
| AMBIENT TEMPERATURE | : | 22° C \pm 1° C | RELATIVE HUMIDITY | : | 51 %RH \pm 10 % RH |

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

| <u>INSTRUMENT</u> | <u>MODEL</u> | <u>SERIAL No</u> | <u>CERTIFICATE No</u> | <u>DUE DATE</u> |
|------------------------|--------------|------------------|-----------------------|-----------------|
| 1) STANDARD WEIGHT SET | E2 | QK-I-151 | C02210415 | 09-Feb-23 |

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

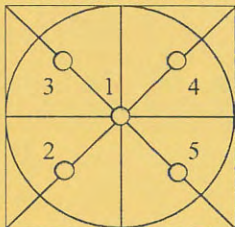
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000048 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY (\pm g) |
|-------------------|---------------------|----------------|------------------------|
| 0.00 | 0.0000 | 0.0000 | 0.000078 |
| 0.10 | 0.1000 | 0.0000 | 0.000078 |
| 0.20 | 0.2000 | 0.0000 | 0.000078 |
| 0.50 | 0.5000 | 0.0000 | 0.000079 |
| 1.00 | 1.0000 | 0.0000 | 0.000079 |
| 2.00 | 2.0000 | 0.0000 | 0.000080 |
| 5.00 | 5.0000 | 0.0000 | 0.000081 |
| 10.00 | 10.0000 | 0.0000 | 0.000084 |
| 20.00 | 20.0000 | 0.0000 | 0.000089 |
| 50.00 | 50.0000 | 0.0000 | 0.00011 |
| 100.00 | 100.0000 | 0.0000 | 0.00019 |
| 200.00 | 199.9999 | 0.0001 | 0.00032 |

5. OFF CENTER LOADING ERROR



| POINT | READING (g) |
|--------------------|-------------|
| 1 | 99.9999 |
| 2 | 99.9999 |
| 3 | 100.0000 |
| 4 | 99.9999 |
| 5 | 99.9998 |
| OFF-CENTER LOADING | 0.0001 |

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

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

END OF CALIBRATION REPORT

**QUALITY CALIBRATION CO.,LTD.**

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

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

www.qcalibration.com

CERTIFICATE No : 22M2567

REFERENCE No : 64386-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS 105DU

SERIAL No : 1126422905

ID No : BA 05/50

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : TETNITHI W.

CALIBRATION DATE : 11-Mar-22

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 17-Mar-22

RECEIVED DATE : 11-Mar-22

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



CERTIFICATE No : 22M2567

PAGE : 2 OF 2

Calibration Report

| | | | | | |
|---------------------|---|----------------------|-------------------|---|----------------------|
| EQUIPMENT | : | DIGITAL BALANCE | MODEL | : | XS 105DU |
| MANUFACTURER | : | METTLER TOLEDO | S/N | : | 1126422905 |
| ID No | : | BA 05/50 | RECEIVED DATE | : | 11-Mar-22 |
| AIR PRESSURE | : | 1008mbar \pm 1mbar | CALIBRATION DATE | : | 11-Mar-22 |
| AMBIENT TEMPERATURE | : | 22° C \pm 1° C | RELATIVE HUMIDITY | : | 49 %RH \pm 10 % RH |

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT | MODEL | SERIAL No | CERTIFICATE No | DUE DATE |
|------------------------|-------|-----------|----------------|-----------|
| 1) STANDARD WEIGHT SET | E2 | QK-I-151 | C02210415 | 09-Feb-23 |

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

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

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

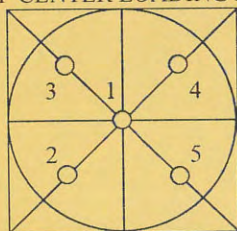
3. REPEATABILITY OF READING AT 20 g WAS 0.000004 g

4. REPEATABILITY OF READING AT 100 g WAS 0.000048 g

5. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

| NOMINAL VALUE (g) | BALANCE READING (g) | CORRECTION (g) | UNCERTAINTY (\pm g) |
|-------------------|---------------------|----------------|------------------------|
| 0.00 | 0.00000 | 0.00000 | 0.000058 |
| 0.02 | 0.01999 | 0.00001 | 0.000058 |
| 0.10 | 0.09999 | 0.00001 | 0.000059 |
| 0.20 | 0.19999 | 0.00001 | 0.000059 |
| 0.50 | 0.50001 | -0.00001 | 0.000058 |
| 1.00 | 1.00001 | -0.00001 | 0.000059 |
| 2.00 | 2.00000 | 0.00000 | 0.000059 |
| 5.00 | 5.00001 | -0.00001 | 0.000061 |
| 10.00 | 10.00005 | -0.00005 | 0.000063 |
| 20.00 | 20.00006 | -0.00006 | 0.000069 |
| 50.00 | 50.0000 | 0.0000 | 0.00011 |
| 100.00 | 100.0001 | -0.0001 | 0.00019 |
| 120.00 | 120.0001 | -0.0001 | 0.00022 |

6. OFF CENTER LOADING ERROR



| POINT | READING (g) | |
|--------------------|-------------|---------|
| 1 | 10.00001 | 50.0000 |
| 2 | 10.00002 | 50.0000 |
| 3 | 10.00001 | 50.0000 |
| 4 | 10.00001 | 50.0000 |
| 5 | 10.00002 | 50.0001 |
| OFF-CENTER LOADING | 0.00001 | 0.0001 |

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

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

END OF CALIBRATION REPORT



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 22TW98

Page.: 1 of 2

Certificate of Testing

| | |
|--|--|
| Equipment : | DO Meter |
| Manufacturer : | YSI |
| Model : | 5000-230V |
| Serial No. : | 15B100751 |
| ID No. : | - |
| Received Date : | 20 April 2022 |
| Test Date : | 21 April 2022 |
| Reference : | 2204-0429WC-1 |
| Submitted by : | S.P.S. Consulting Service Co.,Ltd. 7 Phaholyothin 24, Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900 |
| Laboratory Condition : | Temperature (25 ± 5) °C Humidity (50 ± 20) % |
| Test Procedure : | In - house method : CP-CH9 by Comparison Technique with Azide Modification Method |
| Tested by : | Walalak Sirithean |
| Approved by : |  Approved Signatory |
| <input checked="" type="checkbox"/> Malee Butkruea <input type="checkbox"/> Saithip Meangmai <input type="checkbox"/> Warakorn Lerngagtrakul | |
| Issue Date : | 25 April 2022 |



Cert.No.: 22TW98

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

| <u>Instruments</u> | <u>Serial No.</u> | <u>ID No.</u> | <u>Certificate No.</u> | <u>Due Date</u> |
|--------------------|-------------------|---------------|------------------------|-----------------|
| 1) Burette | - | 130BU10 | 21CG1389 | 25 Mar 2023 |
| 2) Balance | 1126143764 | 140RC004 | 21MM430 | 21 Sep 2022 |

2. Standard Material :-

| <u>Material</u> | <u>Manufacturer</u> | <u>Lot.No.</u> | <u>Assay</u> |
|---------------------------------|---------------------|----------------|--------------|
| Sodium Thiosulfate pentahydrate | Merck | AM1763316 | 100.2% |

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 14J100195

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|---------------------------------------|-------------------------------------|
| 8.12 | 8.14 | 0.0084 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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

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

www.qcalibration.com

CERTIFICATE No : 22T0570

REFERENCE No : 63773-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200


SERIAL No : 15110C0498

ID No : DRB 06/59

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 21-Jan-22

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 21-Jan-22

RECEIVED DATE : 19-Jan-22



QUALITY CALIBRATION CO.,LTD.

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

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

CERTIFICATE No : 22T0570

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : DRB 06/59
RECEIVED DATE : 19-Jan-22
AMBIENT TEMPERATURE : 23° C ± 1° C
MODEL : DRB 200
SERIAL NUMBER : 15110C0498
CALIBRATION DATE : 21-Jan-22
RELATIVE HUMIDITY : 52 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

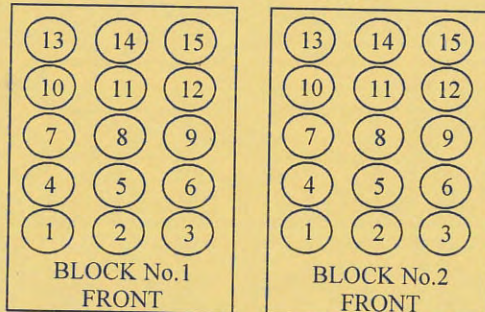
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

2. REFERENCE STANDARD INSTRUMENTS :-

| INSTRUMENT | MODEL | SERIAL No | CERTIFICATE No | DUE DATE |
|-------------------------------|-------------|-----------|----------------|-----------|
| 1) DATA LOGGER WITH TC TYPE K | HYDRA 2635A | 8009008 | 21T6767 | 10-Jul-22 |

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

| Block No. | 1 | 2 |
|---|------|-------|
| Controller temperature (°C) | 145 | 145 |
| Indicating Temperature | 145 | 145 |
| Measured Temperature (°C) at Spread Locations | 1 | 150.5 |
| | 2 | 150.6 |
| | 3 | 149.7 |
| | 4 | 150.2 |
| | 5 | 149.9 |
| | 6 | 150.1 |
| | 7 | 150.1 |
| | 8 | 149.7 |
| | 9 | 150.6 |
| | 10 | 149.6 |
| | 11 | 149.9 |
| | 12 | 149.6 |
| | 13 | 149.7 |
| | 14 | 149.8 |
| | 15 | 149.6 |
| Uncertainty of Measurement(± °C) | 0.86 | 0.86 |

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

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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

END OF CALIBRATION REPORT

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: CN10925120
Organization Name: S.P.S Consulting service
Organization Location: 7 Soi Phaholyothin Road, Ladyao, Khet Jatujak, Bangkok 10900
Date: March 29, 2022 3:56:41 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.50, GCMS.02.50
Overall Qualification Status: Pass

System Inspection and Basic Safety and Operation

Name: 7890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL
Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: -0.2 psi /5 minutes
Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Date: March 29, 2022 3:56:41 PM
System ID: CN10925120

Setpoint Status:

Pass

Setpoint Actual
Inlet Pressure: 25.0 psi 25.0 psi
Accuracy: 0.0 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Accuracy

Name:

7890

Front

SSL

Setpoint Status:

Pass

Setpoint Actual
Inlet Pressure: 25.0 psi 25.0 psi
Accuracy: 0.0 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name:

7890

Front

FID

Setpoint Status:

Pass

Flow Type:

Fuel

Setpoint:

30.0

mL/min

Measured Flow:

30.4

mL/min

Accuracy:

0.4

mL/min

Agilent Recommended:

≤

10.0

% setpoint

(

3.0

mL/min

)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Date:

March 29, 2022 3:56:41 PM

System ID:

CN10025120

Setpoint Status:

Pass

Flow Type:

Oxidizer

Setpoint:

400.0

mL/min

Measured Flow:

392.6

mL/min

Accuracy:

7.4

mL/min

Agilent Recommended:

<=

10.0

% setpoint

(

40.0

mL/min

)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status:

Pass

Flow Type:

Makeup

Setpoint:

25.0

mL/min

Measured Flow:

25.4

mL/min

Accuracy:

0.4

mL/min

Agilent Recommended:

<=

10.0

% setpoint

(

2.5

mL/min

)

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name:

7890

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

230.0

230.6

°C

Accuracy:

0.6

°C

Agilent Recommended:

>=

-1.0

% setpoint in K

(

-5.0

°C)

<=

1.0

% setpoint in K

(

5.0

°C)

Date:

March 29, 2022 3:56:41 PM

System ID:

CN10025120

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

100.0 100.3 °C

Accuracy:

0.3 °C

Agilent Recommended:

>= -1.0 % setpoint in K

(-3.7 °C)

<= 1.0 % setpoint in K

(3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name:

7890

Setpoint Status:

Pass

Setpoint/Average

Temperature:

100.0 100.2333 °C

Stability:

0.1 °C

Agilent Recommended:

<= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1

Back

SSL

/ Front

FID

Manual Injection

Name:

Not applicable

Setpoint Status:

Completed

Injection Volume on Column:

1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1

Back

SSL

/ Front

FID

Date:

March 29, 2022 3:56:41 PM

System ID:

CN10025120

Name: 7890

Setpoint Status: Pass

Base Signal: 12.1 pA

ASTM Noise

counts

712.29

<= 768.00

Agilent Recommended:

Status: Pass

Drift

counts/Hr

275.82

<= 19200.00

Pass

Overall Noise and Drift Test Status

Pass

Signal to Noise

Tested Combination1 Back SSL / Front FID

Manual Injection

Name: 7890

Setpoint Status: Pass

Signal to Noise: 874687

Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

Log Amp

Tested Combination2 Front SSL / External SQ

Name: 5975C Inert XL with TAD

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Date: March 29, 2022 3:56:41 PM
System ID: CN10025120

| Tested Combination2 | Front | SSL | / External | SQ |
|--------------------------|-------------------------|------|---------------------------|---------------|
| Name: | 5975C inert XL with TAD | | | |
| Setpoint Status: | Pass | | | |
| Amu: | 1050 | m/z | Drift After Five Minutes: | RFPA Voltage: |
| | | | 4 | 485 |
| | | | mV | mV |
| Agilent Recommended: | >= | -100 | and | <= 100 |
| | | | | <= 1100 |
| Overall RFPA Test Status | | | | |
| Pass | | | | |

Tune EI

| Tested Combination2 | Front | SSL | / External | SQ |
|-----------------------------|-------------------------|-----|------------|----|
| Name: | 5975C inert XL with TAD | | | |
| Setpoint Status: | Pass | | | |
| Filament: | 1 | | | |
| Setpoint Status: | Pass | | | |
| Filament: | 2 | | | |
| Overall Tune EI Test Status | | | | |
| Pass | | | | |

Signal to Noise EI

| Tested Combination2 | Front | SSL | / External | SQ |
|----------------------|-------------------------|-----------|------------|----|
| Name: | 5975C inert XL with TAD | | | |
| Source: | EI - Inert | Filament: | 1 | |
| Setpoint Status: | Pass | | | |
| Signal to Noise: | | 332 | | |
| Agilent Recommended: | >= | 320 | | |

Date: March 29, 2022 3:56:41 PM
System ID: CN10020420

Source: EI - Inert Filament: 2

Setpoint Status: Pass

Signal to Noise: 422

Agilent Recommended: \geq 320

Overall Signal to Noise EI Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

| | |
|--------------|----------------------|
| System ID | CN10925120 |
| Manufacturer | Agilent Technologies |
| Name | 7890 |

Tested Combination1

| | |
|---------------------|------------------|
| Injection Technique | Manual Injection |
| Sampler Identifier | Sampler 1 |
| Inlet | Back |
| Detector | Front |
| LTM Included? | No |

Tested Combination2

| | |
|---------------------|------------------|
| Injection Technique | Manual Injection |
| Sampler Identifier | Sampler 2 |
| Inlet | Front |
| Detector | External |
| LTM Included? | No |

Sampler 1

| | |
|---------------------|----------------------|
| Manufacturer | Agilent Technologies |
| Type | Manual Injection |
| Usage | Sample Injection |
| Syringe Volume (µL) | 10 |

Sampler 2

| | |
|---------------------|----------------------|
| Manufacturer | Agilent Technologies |
| Type | Manual Injection |
| Usage | Sample Injection |
| Syringe Volume (µL) | 10 |

Date: March 29, 2022 3:56:41 PM
System ID: CN10925120

Mainframe 1

| | |
|-------------------|----------------------|
| Manufacturer | Agilent Technologies |
| Name | 7890 |
| Model Number | G3440A |
| Serial Number | CN10925120 |
| Firmware Revision | A.01.10.3 |
| Oven Type | Standard |

Inlet 1

| | |
|--------------|-----------------------------------|
| Manufacturer | Agilent Technologies |
| Name | 7890 |
| Type | SSL |
| Location | Front |
| Carrier Gas | Helium |
| Control Type | Electronic Pressure Control (EPC) |
| Purged Inlet | Yes |

Inlet 2

| | |
|--------------|-----------------------------------|
| Manufacturer | Agilent Technologies |
| Name | 7890 |
| Type | SSL |
| Location | Back |
| Carrier Gas | Helium |
| Control Type | Electronic Pressure Control (EPC) |
| Purged Inlet | Yes |

Detector 1

| | |
|--------------|-----------------------------------|
| Manufacturer | Agilent Technologies |
| Name | 7890 |
| Type | FID |
| Adapter | Capillary |
| Control Type | Electronic Pressure Control (EPC) |
| Location | Front |
| Makeup Gas | Nitrogen |

Detector 2

| | |
|--------------|----------------------|
| Manufacturer | Agilent Technologies |
| Name | Mass Spectrometer |
| Type | Mass Spectrometer |
| Location | External |

Mass Spectrometer 1

| | |
|-----------------------|-------------------------|
| Manufacturer | Agilent Technologies |
| Type | SQ |
| Name | 5975C inert XL with TAD |
| Serial Number | US91732743 |
| Firmware Revision | 5975 5.02.07 |
| High Vacuum System | Turbo Pump |
| Scouting Run Standard | OFN Std |

MS EI Source 1

| | |
|---------------------|----------------------|
| Manufacturer | Agilent Technologies |
| Source Type | EI - Inert |
| Number of filaments | 2 |

Electronic Signature

Purpose

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Details

| | |
|--------------------------|---|
| Full Name of Signer: | Saenguthai Tarak |
| Logged On User Name: | saenguthai.tarak@non.agilent.com |
| Signature Creation Date: | March 29, 2022 |
| Reason for Signature: | Executed protocol and published this original version of document |

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| | |
|------------|---------------------------|
| Date: | March 29, 2022 3:56:41 PM |
| System ID: | CN10925120 |

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3\$KOMV

System Id: CN10925120
 Print Date: March 29, 2022 3:56:43 PM

OQ_GCMS_SPS CN10925120 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------|-------------------|--------------------|---|--|
| March 29, 2022 1:45:41 PM | Audit | SessionCreated | Session | None |
| March 29, 2022 1:45:41 PM | Start | Configuration | Session | None |
| March 29, 2022 1:45:41 PM | Audit | Entitlement | Licensing | User is Nonpaying and does not require an unlock code |
| March 29, 2022 1:46:18 PM | Audit | EqpLoaded | Session | EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.50/Gc.02.50.eqp], EQP File Name: [Gc.02.50.eqp], EQP Name: [AgilentRecommended] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.50/GcMs.02.50.eqp], EQP File Name: [GcMs.02.50.eqp], EQP Name: [AgilentRecommended] |
| March 29, 2022 1:46:20 PM | End | Configuration | Session | None |
| March 29, 2022 1:46:24 PM | Start | Qualification | Session | OQ |
| March 29, 2022 1:46:24 PM | Start | Execution | System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated | None |
| March 29, 2022 1:47:33 PM | End | Execution | System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated | Run Count : 1 |

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: CN10925120
 Print Date: March 29, 2022 3:56:43 PM

OQ_GCMS_SPS CN10925120 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------|-------------------|--------------------|---|----------------------|
| March 29, 2022 1:47:36 PM | Start | Execution | Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi | None |
| March 29, 2022 1:47:47 PM | End | Execution | Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi | Run Count : 1 |
| March 29, 2022 1:47:48 PM | Start | Execution | Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi | None |
| March 29, 2022 1:47:53 PM | End | Execution | Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi | Run Count : 1 |
| March 29, 2022 1:47:54 PM | Start | Execution | Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi | None |
| March 29, 2022 1:48:02 PM | End | Execution | Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi | Run Count : 1 |
| March 29, 2022 1:48:04 PM | Start | Execution | Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint | None |
| March 29, 2022 1:48:18 PM | End | Execution | Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint | Run Count : 1 |
| March 29, 2022 1:48:20 PM | Start | Execution | Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint | None |
| March 29, 2022 1:48:26 PM | End | Execution | Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint | Run Count : 1 |

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Date: March 29, 2022 3:56:41 PM
 System ID: CN10925120

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: CN10925120
 Print Date: March 29, 2022 3:56:43 PM

OQ_GCMS_SPS CN10925120 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------|-------------------|--------------------|---|----------------------|
| March 29, 2022 1:48:27 PM | Start | Execution | Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint | None |
| March 29, 2022 1:48:40 PM | End | Execution | Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint | Run Count : 1 |
| March 29, 2022 1:48:42 PM | Start | Execution | GC Oven Temperature Accuracy - 7890: - Temperature ; Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | None |
| March 29, 2022 1:49:00 PM | Audit | Data | GC Oven Temperature Accuracy - 7890: - Temperature ; Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Manual Data Entry |
| March 29, 2022 1:49:03 PM | End | Execution | GC Oven Temperature Accuracy - 7890: - Temperature ; Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Run Count : 1 |
| March 29, 2022 1:49:06 PM | Start | Execution | GC Oven Temperature Accuracy - 7890: - Temperature ; Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | None |
| March 29, 2022 1:49:30 PM | Audit | Data | GC Oven Temperature Accuracy - 7890: - Temperature ; Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Manual Data Entry |
| March 29, 2022 1:49:31 PM | End | Execution | GC Oven Temperature Accuracy - 7890: - Temperature ; Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K | Run Count : 1 |
| March 29, 2022 1:49:33 PM | Start | Execution | GC Oven Temperature Stability - 7890: - Temperature ; Oven - S: 100.0°C - L: <= 0.5°C | None |

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Date: March 29, 2022 3:56:41 PM
 System ID: CN10925120

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: CN10925120
 Print Date: March 29, 2022 3:56:43 PM

OQ_GCMS_SPS CN10925120 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------|-------------------|--------------------|---|--|
| March 29, 2022 1:50:29 PM | Audit | Data | GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C | Manual Data Entry |
| March 29, 2022 1:50:30 PM | End | Execution | GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C | Run Count : 1 |
| March 29, 2022 3:15:23 PM | Start | Execution | GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated | None |
| March 29, 2022 3:15:26 PM | Start | Execution | Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour | None |
| March 29, 2022 3:15:39 PM | Start | Execution | GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated | None |
| March 29, 2022 3:16:02 PM | Audit | Data | GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated | Data files Path : F:\PMOQ2022\SC_FID.D\FID 1A.ch |
| March 29, 2022 3:16:37 PM | End | Execution | GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated | Run Count : 1 |
| March 29, 2022 3:16:39 PM | Start | Execution | Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour | None |
| March 29, 2022 3:25:39 PM | Start | Execution | Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour | None |

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Date: March 29, 2022 3:56:41 PM
 System ID: CN10925120

User Name: saenguthal.tarak
 Hostname: LAPTOP-CQ3SKOMV

System Id: CN10925120
 Print Date: March 29, 2022 3:56:43 PM

OQ_GCMS_SPS CN10925120 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------|-------------------|--------------------|--|---|
| March 29, 2022 3:26:13 PM | Audit | Data | Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour | Data files Path : F:\PMOQ2022\IND_FID.D\FID1A.ch |
| March 29, 2022 3:26:19 PM | End | Execution | Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour | Run Count : 1 |
| March 29, 2022 3:27:37 PM | Start | Execution | Signal to Noise - Manual Injection, Back SSL, Front FID: - Detector FID - L: >= 300000 | None |
| March 29, 2022 3:27:49 PM | Audit | Data | Signal to Noise - Manual Injection, Back SSL, Front FID: - Detector FID - L: >= 300000 | Data files Path : F:\PMOQ2022\SN_FID.D\FID1A.ch |
| March 29, 2022 3:28:18 PM | End | Execution | Signal to Noise - Manual Injection, Back SSL, Front FID: - Detector FID - L: >= 300000 | Run Count : 1 |
| March 29, 2022 3:29:49 PM | Audit | AcqRestarted | Session | None |
| March 29, 2022 3:30:44 PM | Audit | SessionReloaded | Session | None |
| March 29, 2022 3:30:47 PM | Start | Qualification | Session | OQ |
| March 29, 2022 3:30:53 PM | Start | Execution | Log Amp - 5975C Inert XL with TAD SQ: - Source: EI - Inert | None |
| March 29, 2022 3:31:02 PM | End | Execution | Log Amp - 5975C Inert XL with TAD SQ: - Source: EI - Inert | Run Count : 1 |
| March 29, 2022 3:31:05 PM | Start | Execution | RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert | None |
| March 29, 2022 3:33:09 PM | End | Execution | RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert | Run Count : 1 |
| March 29, 2022 3:33:11 PM | Start | Execution | Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated) | None |

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Date: March 29, 2022 3:56:41 PM
 System ID: CN10925120

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKQMV

System Id: CN10925120
 Print Date: March 29, 2022 3:56:43 PM

OQ_GCMS_SPS CN10925120 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------|-------------------|--------------------|--|--|
| March 29, 2022 3:33:43 PM | End | Execution | Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated) | Run Count : 1 |
| March 29, 2022 3:33:45 PM | Start | Execution | Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated) | None |
| March 29, 2022 3:34:05 PM | End | Execution | Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated) | Run Count : 1 |
| March 29, 2022 3:34:37 PM | Start | Execution | Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320 | None |
| March 29, 2022 3:34:51 PM | Audit | Data | Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320 | Data files Path : F:\PMOQ2022\SN_F1_05.D\ DATASIM.MS |
| March 29, 2022 3:35:27 PM | End | Execution | Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320 | Run Count : 1 |
| March 29, 2022 3:35:30 PM | Start | Execution | Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320 | None |
| March 29, 2022 3:35:58 PM | Start | Execution | Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320 | None |

User Name: saenguthai.tarak
 Hostname: LAPTOP-CQ3SKOMV


System Id: CN10925120
 Print Date: March 29, 2022 3:56:43 PM

OQ_GCMS_SPS CN10925120 Transaction log :

| Time | Transaction State | Activity Performed | Type of Transaction | Optional Information |
|---------------------------|-------------------|--------------------|--|---|
| March 29, 2022 3:36:32 PM | Start | Execution | Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320 | None |
| March 29, 2022 3:36:46 PM | Audit | Data | Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320 | Data files Path : F:\PMOQ2022\SN_F2_05.D\ DATASIM.MS |
| March 29, 2022 3:36:53 PM | End | Execution | Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320 | Run Count : 1 |
| March 29, 2022 3:36:58 PM | End' | Qualification | Session | OQ |
| March 29, 2022 3:36:58 PM | Start | Reporting | Session | None |
| March 29, 2022 3:50:19 PM | Audit | Reporting | Session | Report Generated : Certificate |

GC Clarus 600/680 Preventive Maintenance (PM)

| | | | |
|---|--|--|-------------|
| Company Name: | S.P.S. Consulting Service Co.,Ltd | | |
| Address (Instrument Location): | 7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900. | | |
| Serial Number: | 680S14042502 | Service Tag: | N68APSSFEMP |
| Customer Name (if applicable): | Ms.Sujinda | PM number : | 2 of 2 |
| Service Engineer Name: | Pramote Chaisorn | Service Order Number: | WO-01841730 |
| Date PM Performed: (DD-MMM-YYYY) | 02-Sep-2022 | Next PM Due Date: (DD-MMM-YYYY) | 02-Mar-2023 |

| Part Number | Release | Publication Date |  |
|-------------|---------|------------------|---|
| TH09370070 | C | August 2016 | |

Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

| Component / Specific Model | Serial # | Software Version | Configuration Notes |
|----------------------------|--------------|------------------|---------------------|
| Clarus680 | 680S14042502 | Totalchrom6.3.2 | |
| Clarus SQ8T | 648N4050804 | Turbomass 6.4 | |
| AtomX | US14113002 | Tekma AtomX | |
| | | | |

Parts Lists

| Additional Tools Required for PM | | | | |
|---|---------------------|----------|-------------|------------------------------|
| Part Number (if applicable) | Description | Quantity | Serial # | Calibration Due Date (MM/YY) |
| LF21-0503 | Fluke179 multimeter | 1 | 22460228 | 04-Nov-2022 |
| | | | | |
| Additional Reagents and Standards Required for PM | | | | |
| Part Number (if applicable) | Description | Quantity | Batch/Lot # | Expiration Date (MM/YY) |
| N/A | | | | |
| | | | | |

Procedure Checklist

Use () to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.

- ☒ Check incoming AC line voltage for proper levels and grounding.

L-N 220 Volt

L-G 220 Volt

N-G 0.35 Volt

**Neutral to ground not more than 0.5 volts peak to peak*

- ☒ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

- ☒ Inspect the customer log book and make any appropriate PM entries.

- ☒ Leak check all fittings from the gas source to instrument.

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

- ☒ Inspect for functional and clean electronic cooling and oven vent fans

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

- ☐ Check sub-ambient option. (If installed).

Oven temperature set point 5 °C ☐ Pass ☐ Fail

- ☒ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.

- ☒ Check flows, including split flows if applicable. Calibrate if necessary.

| | |
|--------------|------|
| Carrier flow | Pass |
| Split flow | Pass |
- ☒ Check detector gas flows and adjust if necessary.

| | |
|---------------|------|
| Detector flow | Pass |
|---------------|------|
- ☒ Autosampler installed ☒ Yes ☐ No

| | |
|-------------------|---|
| Check autosampler | sensor for wear and replace if necessary. |
| Vial sensor | Pass |
| Door sensor | Pass |
| Tower sensor | Pass |
| Plunger sensor | Pass |
| Elevator sensor | Pass |
- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.
- ☒ Check firmware version. Upgrade to current levels if necessary.

| | |
|------------------|------------|
| Firmware version | <u>6.5</u> |
|------------------|------------|
- ☒ Measure all accessible power supply voltages.

| | |
|----------|------|
| 5 Volt | Pass |
| +15 Volt | Pass |
| -15 Volt | Pass |
| 24 Volt | Pass |
- ☒ Record all detector voltage signal.

| | |
|--------------------|-----------------|
| Detector Channel A | <u>0.89</u> mV. |
| Detector Channel B | <u>NA</u> mV. |

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

| | |
|---|------|
| <input checked="" type="checkbox"/> BRAM | Pass |
| <input checked="" type="checkbox"/> EPROM | Pass |
- ☒ Run Autosampler diagnostics.

| | |
|---|------|
| <input checked="" type="checkbox"/> BRAM | Pass |
| <input checked="" type="checkbox"/> EPROM | Pass |

4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

Additional Comments

| Additional Comments Regarding the PM |
|--------------------------------------|
| |
| |
| |

Review


| | |
|--|---------------------------------------|
| <i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i> | |
| <i>This Clarus600/680 GC Pass the preventive maintenance.</i> | |
| Review of Preventive Maintenance: | |
| Authorized PerkinElmer Representative: Pramote Chaisorn | Date: 02-Sep-2022 (DD-MMM-YYYY) |
| Authorized Customer Representative: | Date: 02-Sep-2022 (DD-MMM-YYYY) |

เอกสารแนบที่ ง-4

คุณภาพดิน

GC Clarus 600/680 Preventive Maintenance (PM)

| | | | |
|---|--|--|-------------|
| Company Name: | S.P.S. Consulting Service Co.,Ltd | | |
| Address (Instrument Location): | 7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900. | | |
| Serial Number: | 680S14042502 | Service Tag: | N68APSSFXMP |
| Customer Name (if applicable): | Ms.Sujinda | PM number : | 2 of 2 |
| Service Engineer Name: | Pramote Chaisorn | Service Order Number: | WO-01841730 |
| Date PM Performed: (DD-MMM-YYYY) | 02-Sep-2022 | Next PM Due Date: (DD-MMM-YYYY) | 02-Mar-2023 |

| Part Number | Release | Publication Date |  |
|-------------|---------|------------------|---|
| TH09370070 | C | August 2016 | |

Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

| Component / Specific Model | Serial # | Software Version | Configuration Notes |
|----------------------------|--------------|------------------|---------------------|
| Clarus680 | 680S14042502 | Totalchrom6.3.2 | |
| Clarus SQ8T | 648N4050804 | Turbomass 6.4 | |
| AtomX | US14113002 | Tekma AtomX | |
| | | | |

Parts Lists

| Additional Tools Required for PM | | | | |
|---|---------------------|----------|-------------|------------------------------|
| Part Number (if applicable) | Description | Quantity | Serial # | Calibration Due Date (MM/YY) |
| LF21-0503 | Fluke179 multimeter | 1 | 22460228 | 04-Nov-2022 |
| | | | | |
| Additional Reagents and Standards Required for PM | | | | |
| Part Number (if applicable) | Description | Quantity | Batch/Lot # | Expiration Date (MM/YY) |
| N/A | | | | |
| | | | | |

Procedure Checklist

Use () to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.

- ☒ Check incoming AC line voltage for proper levels and grounding.

L-N 220 Volt

L-G 220 Volt

N-G 0.35 Volt

**Neutral to ground not more than 0.5 volts peak to peak*

- ☒ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

- ☒ Inspect the customer log book and make any appropriate PM entries.

- ☒ Leak check all fittings from the gas source to instrument.

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

- ☒ Inspect for functional and clean electronic cooling and oven vent fans

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

- ☐ Check sub-ambient option. (If installed).

Oven temperature set point 5 °C ☐ Pass ☐ Fail

- ☒ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.

- ☒ Check flows, including split flows if applicable. Calibrate if necessary.

| | |
|--------------|------|
| Carrier flow | Pass |
| Split flow | Pass |
- ☒ Check detector gas flows and adjust if necessary.

| | |
|---------------|------|
| Detector flow | Pass |
|---------------|------|
- ☒ Autosampler installed ☒ Yes ☐ No

| | |
|---|------|
| Check autosampler sensor for wear and replace if necessary. | |
| Vial sensor | Pass |
| Door sensor | Pass |
| Tower sensor | Pass |
| Plunger sensor | Pass |
| Elevator sensor | Pass |
- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.
- ☒ Check firmware version. Upgrade to current levels if necessary.

| | |
|------------------|-----|
| Firmware version | 6.5 |
|------------------|-----|
- ☒ Measure all accessible power supply voltages.

| | |
|----------|------|
| 5 Volt | Pass |
| +15 Volt | Pass |
| -15 Volt | Pass |
| 24 Volt | Pass |
- ☒ Record all detector voltage signal.

| | | |
|--------------------|------|-----|
| Detector Channel A | 0.89 | mV. |
| Detector Channel B | NA | mV. |

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

| | |
|-------|------|
| BRAM | Pass |
| EPROM | Pass |
- ☒ Run Autosampler diagnostics.

| | |
|-------|------|
| BRAM | Pass |
| EPROM | Pass |

4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

Additional Comments

| Additional Comments Regarding the PM |
|--------------------------------------|
| |
| |
| |

Review

| | |
|--|---------------------------------------|
| <i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i> | |
| <i>This Clarus600/680 GC Pass the preventive maintenance.</i> | |
| Review of Preventive Maintenance: | |
| Authorized PerkinElmer Representative: Pramote Chaisorn | Date: 02-Sep-2022 (DD-MMM-YYYY) |
| Authorized Customer Representative: | Date: 02-Sep-2022 (DD-MMM-YYYY) |