

ภาคผนวก ง

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ใบแสดงการตรวจเทียบเครื่องมือ



## High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Jan 14, 2022  
 Hi-Vol Pump No. : BH-008 Indicator No. : CM-01  
 Amb. Temp (°C) : 25 Press (mmHg) : 760  
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) ( cm. )	True H <sub>2</sub> O ( in. )	Actual Flow (Y) (cfm)	XY	X <sup>2</sup>	Remark
18	17.40	12.50	58.84	1,023.82	302.76	
13	14.40	10.10	53.20	766.08	207.36	
10	11.60	7.80	46.90	544.04	134.56	
7	7.60	5.10	38.17	290.09	57.76	
5	4.80	3.10	30.04	144.19	23.04	
Sum	55.80	38.60	227.15	2,768.22	725.48	

Calibrated by : Punkawin K. Approved by : W. Haya K.



## High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Jan 14, 2022  
 Hi-Vol Pump No. : BH-015 Indicator No. : CM-01  
 Amb. Temp (°C) : 25 Press (mmHg) : 760  
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) ( cm. )	True H <sub>2</sub> O ( in. )	Actual Flow (Y) (cfm)	XY	X <sup>2</sup>	Remark
18	19.20	12.80	59.53	1,142.98	368.64	
13	15.60	10.20	53.45	833.82	243.36	
10	12.40	8.00	47.48	588.75	153.76	
7	8.20	5.20	38.53	315.95	67.24	
5	5.20	3.20	30.50	158.60	27.04	
Sum	60.60	39.40	229.49	3,040.09	860.04	

Calibrated by : Punkawin K. Approved by : W. Haya K.



## High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Jan 13, 2022  
 Hi-Vol Pump No. : BH-018 Indicator No. : CM-01  
 Amb. Temp (°C) : 25 Press (mmHg) : 760  
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) ( cm. )	True H <sub>2</sub> O ( in. )	Actual Flow (Y) (cfm)	XY	X <sup>2</sup>	Remark
18	17.00	12.40	58.61	996.37	289.00	
13	14.00	10.20	53.45	748.30	196.00	
10	11.00	8.00	47.48	522.28	121.00	
7	7.20	5.20	38.53	277.42	51.84	
5	4.20	3.20	30.50	128.10	17.64	
Sum	53.40	39.00	228.57	2,672.47	675.48	

Calibrated by : Punkawin Approved by : Wittaya K.



## High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Jan 13, 2022  
 Hi-Vol Pump No. : BH-027 Indicator No. : CM-01  
 Amb. Temp (°C) : 25 Press (mmHg) : 760  
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) ( cm. )	True H <sub>2</sub> O ( in. )	Actual Flow (Y) (cfm)	XY	X <sup>2</sup>	Remark
18	19.00	12.90	59.76	1,135.44	361.00	
13	15.40	10.40	53.96	830.98	237.16	
10	12.20	8.00	47.48	579.26	148.84	
7	7.80	5.20	38.53	300.53	60.84	
5	4.60	3.20	30.50	140.30	21.16	
Sum	59.00	39.70	230.23	2,986.51	829.00	

Calibrated by : Punkawin Approved by : Wittaya K.

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04NI99E15AC084 Reference Number: 82-401409170-1  
Cylinder Number: EB0108319 Cylinder Volume: 144.4 CF  
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2015 PSIG  
PGVP Number: B52019 Valve Outlet: 660  
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 05, 2019

Expiration Date: Feb 05, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.93 PPM	G1	+/- 1.4% NIST Traceable	01/28/2019, 02/05/2019
NITRIC OXIDE	50.00 PPM	50.82 PPM	G1	+/- 1.4% NIST Traceable	01/28/2019, 02/05/2019
SULFUR DIOXIDE	50.00 PPM	48.82 PPM	G1	+/- 1.0% NIST Traceable	01/28/2019, 02/05/2019
CARBON MONOXIDE	0.5000 %	0.5040 %	G1	+/- 1.1% NIST Traceable	01/31/2019
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060206	CC401947	4950 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	Feb 15, 2019
PRM	12367	APEX1099237	9.82 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Jun 02, 2017
NTRM	12010724	KAL004497	50.03 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Mar 12, 2024
GMS	1114201601	CC506710	4.871 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Nov 14, 2019
NTRM	14010327	KAL004376	49.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Apr 17, 2024

The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Siemens Ultramat 6 J3-599 COHIGH	NDIR	Jan 18, 2019
Nicolet 6700 APW1100391 NO	FTIR	Jan 10, 2019
Nicolet 6700 APW1100391 NO2	FTIR	Jan 10, 2019
Nicolet 6700 APW1100391 SO2	FTIR	Jan 10, 2019

#### Triad Data Available Upon Request

PERMANENT NOTES: PRODUCED IN ACCORDANCE WITH ISO17025 REQUIREMENTS

#### NOTES:

Gross Weight: 27805.3 grams

Net Weight: 4733.2 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol. Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2008 and relate only to items identified on this certificate. Items not identified on this certificate are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

*[Signature]*  
Approved for Release



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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Tel: +66 2709 4860-8 Fax: +66 2324 0917-8



Certificate No.: CP20210096EA

Operation No.: CP2021120017

## Certificate of Calibration

Equipment: Sound Calibrator

Manufacturer: CASELLA

Model/Type: CEL-120/2

Serial No.: 2839225

ID No.:

Customer: SECOT Co.,Ltd.

Address: 239 Rimklongprapa Rd., Bangsue,  
Bangkok 10800 Thailand

Received Date: 21 December 2021

Calibrated Date: 24 December 2021

Issued Date: 28 December 2021

Calibrated by: Ms. Juntapom Kunhakom

Approved by:

( Mr. Sittichai Swaksuriyawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2.00$ , providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

Certificate No.: CP20210096EA

### Calibration Report

Equipment: Sound Calibrator  
Manufacturer: CASELLA  
Model/Type: CEL-120/2  
Serial No.: 2839225  
ID No.: -  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-  
IEC 60942:2017

#### Condition of this result of calibration

##### 1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1010-21	13 June 2022
2) Waveform Generator	33511B	MY52302264	0144RF21	17 June 2022
3) Audio Analyzing DMM	2015-P	4079144	E1U210398	2 February 2022
4) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P210047 0255TE21	16 June 2022 7 July 2022

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

##### 3. This certification is traceable to the international system of unit maintained at :-

- Reference standards instrument for Acoustic function
  - National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
  - Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

#### Result of Calibration:-

##### 1. Function : Sound pressure level

Normal Frequency (Hz)	Specified Sound Pressure level (dB)	Measured value (dB)	Deviated value <sup>[1]</sup> (dB)	Acceptance limit <sup>[3]</sup> (dB)
1000	114	114.20	0.20	±0.40

##### 2. Function : Frequency

Normal Sound Pressure level (dB)	Specified Frequency (Hz)	Measured value (Hz)	Deviated value <sup>[2]</sup> (%)	Acceptance limit <sup>[3]</sup> (%)
114	1000	1000.0	0.0	±1.7

Certificate No.: CP20210096EA

### Calibration Report

##### 3. Function : Total distortion + noise

Normal Sound Pressure level (dB)	Normal Frequency (Hz)	Measured value <sup>[4]</sup> (%)	Acceptance limit <sup>[5]</sup> (%)
114	1000	0.4	3.0

##### Uncertainty of measurement

Function	Uncertainty	Maximum-permitted uncertainty of measurement
Sound pressure level	0.10 dB	0.35 dB
Frequency	0.10 %	0.20 %
Total distortion + noise	0.40 %	1.00 %

- Note:
- [1] The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.
  - [2] The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.
  - [3] The acceptance limit is for the deviated value.
  - [4] The measured value is the total distortion + noise, measured over the frequency range from 20 Hz to 20 kHz.
  - [5] The acceptance limit is for the Measured value.

Remarks: 1. Acceptance limit was IEC 60942:2017 Class 2.

-- End of Report --



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FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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Certificate No.: CP20210095EA  
Operation No.: CP2021120016

### Certificate of Calibration

Equipment: Sound Calibrator  
Manufacturer: RION  
Model/Type: NC-74  
Serial No.: 34283648  
ID No.:  
Customer: SECOT Co.,Ltd.  
Address: 239 Rimklongprapa Rd., Bangsue,  
Bangkok 10800 Thailand  
Received Date: 21 December 2021  
Calibrated Date: 24 December 2021  
Issued Date: 28 December 2021  
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:

( Mr. Sittichai Swaksuriyawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2.00$ , providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20210095EA

### Calibration Report

Equipment: Sound Calibrator  
Manufacturer: RION  
Model/Type: NC-74  
Serial No.: 34283648  
ID No.:  
Ambient Temperature:  $(23 \pm 2) ^\circ\text{C}$   
Relative Humidity:  $(50 \pm 15) \%$   
Pressure:  $(101.3 \pm 1.5) \text{ kPa}$   
Method of Calibration :-  
IEC 60942:2017

#### Condition of this result of calibration

##### 1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1010-21	13 June 2022
2) Waveform Generator	33511B	MY52302264	0144RF21	17 June 2022
3) Audio Analyzing DMM	2015-P	4079144	E1U210398	2 February 2022
4) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P210047 0255TE21	16 June 2022 7 July 2022

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

3. This certification is traceable to the international system of unit maintained at :-

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

#### Result of Calibration:-

##### 1. Function : Sound pressure level

Normal	Specified Sound	Measured value	Deviated value <sup>[1]</sup>	Acceptance limit <sup>[3]</sup>
Frequency (Hz)	Pressure level (dB)	(dB)	(dB)	(dB)
1000	94	94.22	0.22	$\pm 0.25$

##### 2. Function : Frequency

Normal Sound	Specified Frequency	Measured value	Deviated value <sup>[2]</sup>	Acceptance limit <sup>[3]</sup>
Pressure level (dB)	(Hz)	(Hz)	(%)	(%)
94	1000	1003.0	0.3	$\pm 0.7$



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20210095EA

Calibration Report

3. Function : Total distortion + noise

Normal	Normal	Measured value <sup>[4]</sup>	Acceptance limit <sup>[5]</sup>
Sound Pressure level (dB)	Frequency (Hz)	(%)	(%)
94	1000	1.3	2.5

Uncertainty of measurement

Function	Uncertainty	Maximum-permitted uncertainty of measurement
Sound pressure level	0.10 dB	0.15 dB
Frequency	0.10 %	0.20 %
Total distortion + noise	0.40 %	0.50 %

- Note: [1] The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.  
[2] The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.  
[3] The acceptance limit is for the deviated value.  
[4] The measured value is the total distortion + noise, measured over the frequency range from 20 Hz to 20 kHz.  
[5] The acceptance limit is for the Measured value.
- Remarks: 1. Using the 1/2-inch microphone adaptor NC-74-002.  
2. Acceptance limit was IEC 60942:2017 Class 1.

-- End of Report --

## CERTIFICATE OF CALIBRATION

ISSUED BY Noisemeters

DATE OF ISSUE 06/04/22

CERTIFICATE NUMBER 172691

NoiseMeters

NoiseMeters  
Acoustic House  
Bridlington Road  
Hunmanby  
YO14 0PH  
United Kingdom  
www.noisemeters.com

Page 1 of 1

Test engineer:  
Nigel Smith  
Electronically signed:

## doseBadge Reader

### Instrument

Manufacturer: Cirrus Research plc  
Model Number: RC:110A

Serial Number: 95167  
Notes:

### Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 06 April 2022

### Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

### Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Initial	113.86	990.4	0.48
Adjusted	114.00	990.4	0.48
Uncertainty	± 0.11	± 0.14	± 0.10
Tolerances	± 0.60	± 2.00	± 4.00

### Environmental Conditions

Pressure: 98.30 kPa  
Temperature: 22.8 °C  
Humidity: 40.3 %

### Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.



Request Service No. 098/65

Page 1 of 3

### Calibration Certificate

Nomenclature : Brand : Mettler Toledo Type : Top-Loading Electronic Balance

Model : AG245 Serial No. : 1117293916 (198129-0)

Submitted by : Laboratory of SECOT CO., LTD.

Location of Calibration : BAL Room , 6<sup>th</sup> Floor, Secot Co., Ltd.

Calibration range : 0 – 200 g Scale division : 0.00001 g (41g) / 0.0001 g (210g)

Calibration date : May 26, 2022

Reference Standard No. M2110188S, M210183, M220177

Traceable to : Metrological Center SCI ECO Services Co., Ltd, THAI CALIBRATION SERVICES Co., Ltd

Ambient Condition : Temperature 24.28 – 24.42 °C

Humidity 48.10 – 50.90 % RH

Calibrated By : Sasipa Jaidee Approved By : [Signature]

( Miss Sasipa Jaidee )

( Miss Siripa Jhannong )

Testing Officer

Chief of Technical Management

Date : 26/05/2022

Date : 26/05/2022

Issued Date : May 27, 2022

### Measurement Report

Request Service No. 098/65

Page 2 of 3

Description: Brand : Mettler Toledo Type : Top-Loading Electronic Balance

Model : AG245 Serial No. : 1117293916 (198129-0)

Calibration range : 0 – 200 g Scale division : 0.00001 g (41g) / 0.0001 g (210g)

Calibration date : May 26, 2022

Ambient Condition : Temperature 24.28 – 24.42 °C Relative humidity 48.10 – 50.90 % RH

Measurement data :

#### 1. Repeatability of Reading :

Load (g)	Standard Deviation of Reading (g)	Maximum Difference between Successive Reading (g)
50	0.000047	0.0002
100	0.000067	0.0002
150	0.000048	0.0001
200	0.000052	0.0001

#### 2. Off-Center Loading :

A Mass of 50.0000 g was placed and moved to various position on the pan.

Unit : g

Center	Front	Left	Back	Right	Center	Maximum Difference
50.00020	50.00046	50.00030	50.00000	50.00010	50.00020	0.00026

Issued Date : May 27, 2022



## 3. Departure from Nominal Value :

Reading (g)	Correction (g)	Uncertainty (+/- g)
0	0.000000	$\pm 0.000008$
0.5	0.000005	$\pm 0.000014$
1	-0.000014	$\pm 0.000018$
10	-0.000071	$\pm 0.000034$
20	-0.000091	$\pm 0.000047$
40	-0.000151	$\pm 0.000074$
60	-0.00030	$\pm 0.00012$
80	-0.00021	$\pm 0.00014$
100	-0.00038	$\pm 0.00016$
120	-0.00041	$\pm 0.00018$
140	-0.00048	$\pm 0.00021$
160	-0.00050	$\pm 0.00023$
180	-0.00067	$\pm 0.00025$
200	-0.00124	$\pm 0.00027$

Calibrated by : Sasipa Jaidee Approved By : [Signature]

(Miss Sasipa Jaidee)

(Miss Siripa Jhannong)

Testing Officer

Chief of Technical Management

Date : 26/05/2022Date : 26/05/2022

Issued Date : May 27, 2022



## Calibration Certificate

Nomenclature : Brand : Sartorius Type : Top-Loading Electronic Balance

Model : BSA224S-CW Serial No. : 32191636

Submitted by : Laboratory of SECOT CO., LTD.

Location of Calibration : BAL Room , 6<sup>th</sup> Floor, Secot Co., Ltd.

Calibration range : 0 – 200 g Scale division : 0.0001 g (220 g)

Calibration date : May 24, 2022

Reference Standard No. M220177, M210183

Traceable to : Metrological Center SCIECO Services Co., Ltd.

Ambient Condition : Temperature 24.80-24.90 °C

Humidity 50.4-52.9 % RH

Calibrated By : [Signature] Approved By : [Signature]

(Miss Khemchuda Insorn)

(Miss Siripa Jhannong)

Testing Officer

Chief of Technical Management

Date : 25/05/2022Date : 25/05/2022

Issued Date : May 25, 2022

## Measurement Report

Request Service No.100/65

Page 2 of 3

Description : Brand : Sartorius

Type : Top-Loading Electronic Balance

Model : BSA224S-CW

Serial No. : 32191636

Calibration range : 0 – 200 g

Scale division : 0.0001 g (220 g)

Calibration date : May 25, 2021

Ambient Condition : Temperature 24.80-24.90 °C Relative humidity 50.4-52.9 % RH

Measurement data :

### 1. Repeatability of Reading :

Load (g)	Standard Deviation of Reading (g)	Maximum Difference between Successive Reading (g)
50	0.00010	0.0003
100	0.00008	0.0003
150	0.00005	0.0001
200	0.00005	0.0001

### 2. Off-Center Loading :

A Mass of 50.0000 g was placed and moved to various position on the pan.

Unit : g

Center	Front	Left	Back	Right	Center	Maximum Difference
49.99980	49.99984	49.99994	49.99986	49.99994	49.99980	0.00014

Issued Date : May 25, 2022

Request Service No. 100/65

Page 3 of 3

### 3. Departure from Nominal Value :

Reading (g)	Correction (g)	Uncertainty (+/- g)
0	0.00000	± 0.00008
1	-0.00004	± 0.00008
5	+0.00013	± 0.00008
10	+0.00018	± 0.00008
20	+0.00009	± 0.00010
40	-0.00005	± 0.00010
60	+0.00012	± 0.00014
80	+0.00017	± 0.00014
100	-0.00020	± 0.00017
120	+0.00003	± 0.00019
140	+0.00004	± 0.00021
160	+0.00006	± 0.00022
180	+0.00004	± 0.00025
200	+0.00002	± 0.00027

Calibrated by :

*Khemchuda Insorn*

(Miss Khemchuda Insorn)

Approved By :

*Miss Siripa Jhannong*

(Miss Siripa Jhannong)

Testing Officer

Chief of Technical Management

Date : 25/05/2022

Date : 25/05/2022

Issued Date : May 25, 2022



Request Service No. 101/65

Page 1 of 3

### Calibration Certificate

Nomenclature : Brand : Mettler Toledo Type : Top-Loading Electronic Balance

Model : AB204-S Serial No. : 1123163292 (209359)

Submitted by : Laboratory of SECOT CO., LTD.

Location of Calibration : BAL Room , 6<sup>th</sup> Floor, Secot Co., Ltd.

Calibration range : 0 – 200 g Scale division : 0.0001 g (220 g)

Calibration date : May 26, 2022

Reference Standard No. M220177, M210183

Traceable to : Metrological Center SCIECO Services Company Limited.

Ambient Condition : Temperature 24.80 - 25.30 °C

Humidity 54.6 - 57.5 % RH

Calibrated By : Janista Kui-on

(Miss Janista Kui-on)

Testing Officer

Date : 27/05/2022

Approved By : Siripa Jhannong

(Miss Siripa Jhannong)

Chief of Technical Management

Date : 27/05/2022

Issued Date : May 27, 2022

### Measurement Report

Request Service No. 101/65

Page 2 of 3

Description : Brand : Mettler Toledo

Type : Top-Loading Electronic Balance

Model : AB204-S

Serial No. : 1123163292 (209359)

Calibration range : 0 – 200 g

Scale division : 0.0001 g (220 g)

Calibration date : May 26, 2022

Ambient Condition : Temperature 24.80-25.30 °C Relative humidity 54.6-57.5 % RH

Measurement data :

#### 1. Repeatability of Reading :

Load (g)	Standard Deviation of Reading (g)	Maximum Difference between Successive Reading (g)
50	0.00008	0.0002
100	0.00010	0.0003
150	0.00010	0.0003
200	0.00012	0.0004

#### 2. Off-Center Loading :

A Mass of 50.0000 g was placed and moved to various position on the pan.

Unit : g

Center	Front	Left	Back	Right	Center	Maximum Difference
50.00004	49.99998	50.00010	50.00008	50.00002	50.00006	0.00006

Issued Date : May 27, 2022

## 3. Departure from Nominal Value :

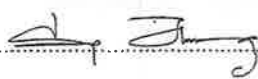
Reading (g)	Correction (g)	Uncertainty (+/- g)
0	0.00000	$\pm 0.00010$
1	+0.00004	$\pm 0.00010$
5	+0.00011	$\pm 0.00010$
10	+0.00002	$\pm 0.00010$
20	-0.00005	$\pm 0.00014$
40	-0.00010	$\pm 0.00020$
60	-0.00004	$\pm 0.00014$
80	-0.00012	$\pm 0.00014$
100	-0.00024	$\pm 0.00016$
120	-0.00025	$\pm 0.00019$
140	-0.00020	$\pm 0.00022$
160	-0.00022	$\pm 0.00025$
180	-0.00015	$\pm 0.00025$
200	-0.00016	$\pm 0.00029$

Calibrated by : Janista Kui-on

(Miss Janista Kui-on)

Testing Officer

Date : 27/05/2022

Approved By : 

(Miss Siripa Jhannong)

Chief of Technical Management

Date : 27/05/2022

Issued Date : May 27, 2022



## Certificate of Calibration

## ICS-1000 : Cation &amp; Anion (ID#057)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

ICS-1000 S/N : 04090295

RFC-30 S/N : 04100666

for

SECOT Co.,Ltd.

Operator Signature : 

Date : Dec 16, 2021

(Mr.Channarong Khiao-un)

Test Engineer



Bangkok High Lab Co.,Ltd.  
4/176 Soi Ladplakao 66, Ladplakao Rd., Anusawari, Bangkhen, Bangkok 10220  
Tel: (662) 971-5800 Fax: (662) 971-5300  
Website: www.bangkokhighlab.com E-mail: info@bangkokhighlab.com



# CERTIFICATE OF CALIBRATION

Certificate No : S2021/168

Page : 1/6

Order No : 399/2021

Customer : SECOT COMPANY LIMITED  
Address : 239 Rimklongprapa Rd., Bangsue, Bangsue, Bangkok 10800  
Instrument : UV/VIS spectrophotometer  
Manufacture : Thermo Scientific  
Model : GENESYS 10S UV-Vis  
Serial Number : 2L9N349007  
Environment : Temperature (25.2 - 24.8) °C  
Humidity (57 - 57) %RH  
Received Date : October 28, 2021  
Calibration Date : October 28, 2021  
Issued Date : November 5, 2021  
Calibrate Status : No Adjustment  
Calibration Area : Customer area  
Roomname : Laboratory Room of SECOT COMPANY LIMITED  
Calibrated By : Kittipong

( Mr.Kittipong Yungsanit )

Calibration Engineer

Approved By : Wanchai

( Mr.Wanchai Meesiri )

Manager



Bangkok High Lab Co.,Ltd.  
4/176 Soi Ladplakao 66, Ladplakao Rd., Anusawari, Bangkhen, Bangkok 10220  
Tel: (662) 971-5800 Fax: (662) 971-5300  
Website: www.bangkokhighlab.com E-mail: info@bangkokhighlab.com



Certificate No : S2021/168

Page : 2/6

Order No : 399/2021

## 1. Photometric Accuracy

CRMs: Neutral Density Glass Filters

CRMs Serial Number: A404

Traceability: Traceable to NIST, U.S.A. through Neutral density filters NIST SRM 930e & 1930, Double Aperture method, through Starna certificate report 108644

Spectral slit width : 1.80 nm

1.1 Reading scale at 420.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4965	0.497	-0.0005	0.0044
0.9630	0.965	-0.0020	0.0038
2.0356	2.037	-0.0013	0.0064

1.2 Reading scale at 440.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4870	0.487	-0.0001	0.0040
0.9433	0.944	-0.0007	0.0040
1.9665	1.970	-0.0038	0.0064

1.3 Reading scale at 465.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4535	0.455	-0.0015	0.0034
0.8780	0.880	-0.0020	0.0040
1.8424	1.845	-0.0022	0.0060



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Website: www.bangkokhighlab.com E-mail: info@bangkokhighlab.com



Certificate No : S2021/168  
Page : 3/6  
Order No : 399/2021

#### 1.4 Reading scale at 546.1 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4706	0.471	-0.0004	0.0028
0.9094	0.911	-0.0016	0.0028
1.8755	1.877	-0.0016	0.0062

#### 1.5 Reading scale at 590.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4887	0.490	-0.0013	0.0029
0.9464	0.946	0.0004	0.0029
1.9021	1.903	-0.0012	0.0061

#### 1.6 Reading scale at 635.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4634	0.464	-0.0006	0.0030
0.8992	0.900	-0.0007	0.0030
1.7824	1.784	-0.0016	0.0062



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Website: www.bangkokhighlab.com E-mail: info@bangkokhighlab.com



Certificate No : S2021/168  
Page : 4/6  
Order No : 399/2021

## 2. Photometric Accuracy

CRMs: Potassium Dichromate in Perchloric acid

CRMs Serial Number: 15086

Blank Serial Number: 15178

Traceability: Traceable to NIST, U.S.A. through crystalline potassium dichromate NIST SRM 935a through Starna certificate report 88921

Spectral slit width : 1.80 nm

Wavelength (nm)	Certificate (Abs)	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
235	0.0000	0.000	0.0000	0.0050
	0.7340	0.732	0.0020	0.0056
257	0.0000	0.000	0.0000	0.0050
	0.8528	0.855	-0.0022	0.0055
313	0.0000	0.000	0.0000	0.0050
	0.2873	0.289	-0.0017	0.0054
350	0.0000	0.000	0.0000	0.0050
	0.6336	0.632	0.0016	0.0056

## 3. Wavelength Accuracy

Spectral slit width : 1.80 nm

3.1 CRMs: Holmium Glass Filter

CRMs Serial Number: W184/H

Traceability: Traceable to NIST Holmium oxide filter NIST SRM 2034, through Starna certificate report 108651

Filter STDs (nm) Certificate	Average Measured Value (nm)	Correction (nm)	Uncertainty ± (nm)
241.74	241.2	0.54	0.12
279.44	279.2	0.24	0.12
287.98	287.8	0.18	0.12
334.10	334.4	-0.30	0.12
361.00	360.8	0.20	0.12
418.61	418.8	-0.19	0.12
453.63	453.8	-0.17	0.12
460.05	460.2	-0.15	0.12
536.66	536.6	0.06	0.12
637.98	637.4	0.58	0.12



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NSC-TISI-TIS 17025  
CALIBRATION 0366

Certificate No : S2021/168  
Page : 5/6  
Order No : 399/2021

### 3.2 CRMs: Didymium Glass Filter

CRMs Serial Number: W184/D

Traceability: Traceable to NIST Didymium filter NIST SRM 2034, through Starna certificate report 108652

Filter STDs (nm) Certificate	Average Measured Value (nm)	Correction (nm)	Uncertainty ± (nm)
585.29	585.4	-0.11	0.12
684.49	684.2	0.29	0.12
740.18	740.0	0.18	0.12
748.48	748.8	-0.32	0.12
807.03	807.6	-0.57	0.12
879.27	879.6	-0.33	0.12

### 4. \*Stray Light

CRMs: Potassium Chloride aqueous solution

CRMs Serial Number: 5469

Blank Serial Number: 8745

Traceability: Traceable to NIST, U.S.A. crystalline potassium chloride NIST SRM2032, through Starna certificate report 88922

Spectral slit width : 1.80 nm

Wavelength (nm)	Certificate	Average Measured
201.28	>2A	2.081
201.28	<1%T	0.9



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NSC-TISI-TIS 17025  
CALIBRATION 0366

Certificate No : S2021/168  
Page : 6/6  
Order No : 399/2021

### 5. \*Spectral Resolution

CRMs: Toluene in Hexane

CRMs Serial Number: 8697

Blank Serial Number: 8716

Traceability: Traceable to toluene in hexane NIST SRM2034, through Starna certificate report 88923

Spectral slit width (nm)	Abs Ratio
0.5	#N/A
1.0	#N/A
1.5	#N/A
2.0	#N/A
3.0	#N/A

Note : \* "Not TISI Accredited" in this certificate have been included for completeness

### Remark:

1. Calibrate Method
  - 1.1 Photometric accuracy: In-house method W-SER-001 based on ASTM E925-02 and ASTM E275-01
  - 1.2 Wavelength accuracy: In-house method W-SER-001 based on ASTM E925-02 and ASTM E275-01
  - 1.3 Stray light: Measuring the CRMs in both absorbance and transmittance unit at wavelength 201.23 nm.  
Base on European Pharmacopoeia V.6.19.3 1984
  - 1.4 Spectral resolution: Measuring the CRMs. The maximum absorbance values were read at closest to 268.7nm and the minimum absorbance values were read at closest 267.0 nm.  
Refer to European Pharmacopoeia V.6.19.3 1984
2. N/A = not available.
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%.
4. This result of calibration was found accurate as shown on date and place of calibration only.
5. This report will certify of calibrated equipment only.

- End of Report -



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel : +66 (0) 2422 8588 Fax : +66 (0) 2422 8588 Website : www.nfi.go.th E-mail : cal@nfi.go.th



## Calibration Certificate

**Certificate No.:** 2104065-001-01  
**Client name:** SECOT CO., LTD.  
**Address:** 239 Rimklongprapa Road,  
Bangsue, Bangsue, Bangkok 10800

Page 1 of 3

**Equipment:** CHAMBER (Hot Air Oven)  
**Manufacturer:** BINDER  
**Model:** ED 53  
**Serial No.:** 01-27152  
**ID No.:** N/A  
**Order No.:** 2104065  
**Operation No.:** 2104065-001  
**Date of Receipt:** 2 August 2021  
**Date of Calibration:** 2 August 2021

**Calibrated by** Mr. Worapob Sooktong  
Scientist

**Approved by** (Mr. Phraphat Tuanjit)

Manager, Division of Calibration Laboratory

**Date of Issue:** 3 August 2021

Responsible for the Technical Management Team

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

This Certificate is issued in accordance with the conditions 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 except with the prior written approval of the National Food Institute.



National Food Institute, Ministry of Industry, Thailand

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Tel : +66 (0) 2422 8588 Fax : +66 (0) 2422 8588 Website : www.nfi.go.th E-mail : cal@nfi.go.th



## Calibration Report

**Certificate No.:** 2104065-001-01  
**Equipment:** CHAMBER (Hot Air Oven)  
**Model:** ED 53 **Serial No.:** 01-27152  
**Resolution:** 1 °C **ID No.:** N/A  
**Manufacturer:** BINDER  
**Date of Calibration:** 2 August 2021

Page 2 of 3

**Location:** Laboratory, SECOT CO., LTD.  
**Environment Condition:** Ambient Temperature ( 29 ± 1 ) °C  
Relative Humidity ( 59 ± 4 ) %  
Line Voltage ( 230 ± 0 ) Volt

### Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.  
- The temperature scale used was based on ITS - 90.  
- All data show below were final values and the initial data may be obtained upon request.

### 2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 640400-01	24 April 2022	NATIONAL FOOD INSTITUTE
	RTD	CH#101-109/ RTD#101-109			

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

### UUC Description :

Time of Record 1 Hour 9 Minute At 104, 110 and 180 °C  
Fresh air Damper ☒ Open Position ☐  
☒ Close  
☐ Not Available

- Result of Calibration : ☒ Without adjustment ☐ After adjustment





National Food Institute, Ministry of Industry, Thailand

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Tel : +66 (0) 2422 8586 Fax : +66 (0) 2422 8558 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## Calibration Report

**Certificate No.:** 2104065-001-01  
**Equipment:** CHAMBER (Hot Air Oven)  
Model: ED 53 Serial No.: 01-27152  
Resolution: 1 °C ID No.: N/A  
Manufacturer: BINDER

**Date of Calibration:** 2 August 2021

Page 3 of 3

**Calibration point:** 104, 110 and 180 °C

**Calibration result:**

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	29.3	55	229.1
MAX	29.5	62	230.0

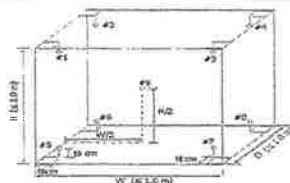


Table 1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
104	104.51	104.81	104.21	104.35	103.34	103.28	103.34	103.03	103.28	0.82
110	110.80	111.16	110.51	110.64	109.63	109.64	109.63	109.34	109.58	0.83
180	181.02	181.32	180.02	180.44	179.66	179.96	179.64	179.40	179.70	0.95

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
103	103	103	103	0.21	1.71	2.11
109	109	109	109	0.21	1.78	2.12
176	176	176	176	0.31	2.05	2.51

**Note** The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC\* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

----- End -----

Handwritten signature/initials

# CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pukked, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.co@yahoo.com, calibratech\_cal@hotmail.com



## Certificate of Calibration

**Certificate No. :** 65-420016-1

Page : 1 of 2

**Submitted by :** Secot Co.,Ltd.

239 RimKlongprapa Road, Bangsue, Bangkok 10800 Thailand

**Equipment :** pH Meter with electrode

pH meter

Manufacturer : Mettler Toledo Model : Seven2Go S2

Range : N/A pH Resolution : 0.01 pH

Serial No. : B924795409 ID No. : N/A

Electrode

Model : InLab Expert Go-ISM Serial No. : 7861180

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

Relative Humidity : (50 ± 15) %

**Date of Received :** 15 February 2022

**Date of Calibration :** 24 February 2022

**Date of Issue :** 24 February 2022

**Calibrated by :** Bunjerd Masri

**Calibration Method :** In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

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

1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
440001	21E997	17 Mar 2023	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61235182	795894	14 Feb 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.985	61223875	769927	15 May 2022	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.008	61244986	795895	25 Feb 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by:   
( Bunjerd Masri )  
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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# CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachan 3 Rd., Bangpoo, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

## Certificate of Calibration

Certificate No. : 65-420016-1

Page : 2 of 2

### Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

Performing standard curve by Multiproduct Calibrator at pH (4,7,10)

Adjustment Curve at nominal pH	Applied Voltage ( mV )	Nominal Value ( pH )	UUC Reading		Correction ( mV )	Uncertainty ( ± mV )
			( pH )	( mV )		
4, 7, 10	177.4800	4	4.00	177	0	0.58
	0.0000	7	7.00	0	0	0.58
	-177.4800	10	10.00	-177	0	0.58

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer ( pH )	UUC Reading ( pH )	Correction ( pH )	Uncertainty ( ± pH )
4, 7, 10	4.008	4.01	0.00	0.010
	6.985	7.00	-0.01	0.011
	10.008	10.01	0.00	0.014

### 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%

- o o o -

*B*



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

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

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

Cert.No.: 21TW260

Page: 1 of 2

## Certificate of Testing

Equipment : DO Meter

Manufacturer : Hanna

Model : HI98193

Serial No. : 06110066101

ID No. :

Received Date : 07 December 2021

Test Date : 13 December 2021

Reference : 2112-0144DN-1

Submitted by : Secot Co.,Ltd.  
239 Rimklongprapa Road,  
Bangsue, Bangkok 10800

Laboratory Condition : Temperature (  $25 \pm 5$  ) °C  
Humidity (  $50 \pm 20$  ) %  
Test Procedure : In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirthean

Approved by :

*Malee*

Approved Signatory

( ☒ ) Malee Butkruea  
( ☐ ) Saithip Meangmai  
( ☐ ) Warakorn Lemgagtrakul

Issue Date : 15 December 2021

B 0276286



Cert.No.: 21TW260  
Page.: 2 of 2

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No.: KC1N2993N

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.16	8.16	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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*Malee*

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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 21CH1690  
Page.: 1 of 2

## Certificate of Calibration

**Equipment :** Conductivity Meter  
**Manufacturer :** Hanna  
**Model :** HI98192  
**Serial No. :** 05200045101  
**ID No. :** -  
**Condition As-Received:** Used Item  
**Received Date :** 07 December 2021  
**Calibration Date :** 13 December 2021  
**Reference :** 2112-0144DN-2  
**Submitted by :** Secot Co., Ltd.  
239 Rimklongprapa Road,  
Bangsue, Bangkok 10800  
**Ambient Temperature :** (25  $\pm$  2.5) °C  
**Relative Humidity :** (50  $\pm$  15) %  
**Calibration Procedure:** In -house method :  
- CP-CH6 : based on direct measurement by  
using certified reference material (CRM)  
**Calibrated by :** Walalak Sirithean

**Approved by :**

(✓) Malee Butkruea  
( ) Saitthip Meangmai  
( ) Warakorn Lerngagtrakul

*Malee*  
Approved Signatory

**Issue Date :** 15 December 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 0035796



Cert.No.: 21CH1690

Page.: 2 of 2

**Condition of this result of calibration**

**1. Reference Standard Instrument :-**

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	9549224	130RC003	21I451	15 Apr 2022

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

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

**2. Certified Reference Materials :-**

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835
- Conductivity calibration solution, Thermo Scientific (traceable to NIST)

Conductivity Solution	Manufacturer	Lot No.	Exp. date
*100 $\mu$ S/cm	Thermo Scientific	101/04	12 Mar 2022
1.413 mS/cm	CPA Chem	761021	02 Aug 2022
12.8806 mS/cm	CPA Chem	754037	28 June 2022

- Control Conductivity calibration solution temperature by Water bath ( $25 \pm 0.1$ )  $^{\circ}$ C

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

**Calibration results**

**Function : Conductivity Measurement**

(\*) After Adjustment at 1.413, 12.8806 mS/cm

Conductivity Electrode Serial No.: 0720001N

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement ( $\pm$ )	Coverage factor k
*100 $\mu$ S/cm	95.42 $\mu$ S/cm	99.93 $\mu$ S/cm	5.1 $\mu$ S/cm	2.00
1.413 mS/cm	1.198 mS/cm	1.412 mS/cm	0.0092 mS/cm	2.00
12.8806 mS/cm	12.49 mS/cm	12.87 mS/cm	0.086 mS/cm	2.00

**Remark** - UUC\* = Unit Under Calibration

- \*: Not NSC - ONSC Accredited

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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*Malee*

a 1086390



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.: 22CH633

Page.: 1 of 2

**Certificate of Calibration**

**Equipment :** Turbidity Meter  
**Manufacturer :** Hanna  
**Model :** HI 98703  
**Serial No. :** 03090023991  
**ID. No. :** -  
**Condition As-Received:** Used Item  
**Received Date :** 6 May 2022  
**Calibration Date :** 10 May 2022  
**Reference :** 2205-0123DN-1  
**Submitted by :** Secof Co.,Ltd.  
 239 Rimklongprapa Road,  
 Bangsue, Bangkok 10800

**Ambient Temperature :** ( $25 \pm 2.5$ )  $^{\circ}$ C  
**Relative Humidity :** ( $50 \pm 20$ ) %  
**Calibration Procedure :** In - house method : CP-CH11  
 based on direct measurement by  
 using Formazin standard solution

**Calibrated by :** Saithip Meangmai

**Approved by :** *Malee*  
 Approved Signatory

- (☒) Malee Butkruea
- (☐) Saithip Meangmai
- (☐) Warakorn Lernagatrakul

**Issue Date :** 12 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 0008849



Cert.No. : 22CH633

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).

Instruments	Serial No.	ID No.	Certificate No.	Due date
1) Thermo-Hygrograph	1103328	130EC010	21H1462	27 June 2022
2) Electronic Balance	N03679	140RC001	21MM429	21 Sep 2022

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

Material	Manufacturer	Lot No.	Assay
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 four - Formazin suspension standard curve by using 0, 20, 100, 800 NTU Turbidity Meter Serial Number : 03090023991

Standard Formazine suspension ( NTU )	UUC* Reading ( NTU )	Uncertainty of Measurement ( ± NTU )	Coverage Factor k
20	20.2	0.490	2.05
40	40.0	0.39	2.00
100	100	0.79	2.00
400	400	1.5	2.11

#### 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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National Food Institute, Ministry of Industry, Thailand

2006 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phat District, Bangkok 10700, Thailand  
Tel : +66 (0) 2422 8688 Fax : +66 (0) 2422 8555 Website : www.nfi.go.th E-mail : cal@nfi.go.th



## Calibration Certificate

Certificate No.: 2104065-002-01  
Client name: SECOT CO., LTD.  
Address: 239 Rimklongprapa Road,  
Bangsue, Bangsue, Bangkok 10800

Page 1 of 3

Equipment: CHAMBER (Incubator)  
Manufacturer: MEMMERT  
Model: ICP 400  
Serial No.: K406.0004  
ID No.: N/A  
Order No.: 2104065  
Operation No.: 2104065-002  
Date of Receipt: 2 August 2021  
Date of Calibration: 2 August 2021

Calibrated by

Mr.Worapob Sooktong  
Scientist

Approved by

( Mr.Pheraphat Tuanjit )  
Manager, Division of Calibration Laboratory

Date of Issue:

3 August 2021

Responsible for the Technical Management Team

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

This Certificate is issued in accordance with the conditions 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 except with the prior written approval of the National Food Institute.



National Food Institute, Ministry of Industry, Thailand

2008 Soi 35, Anin Amarn Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand.  
Tel : +66 (0) 2422 8588 Fax : +66 (0) 2422 8588 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## Calibration Report

**Certificate No.:** 2104065-002-01  
**Equipment:** CHAMBER (Incubator)  
Model: ICP 400 Serial No.: K406.0004  
Resolution: 0.1 °C ID No.: N/A  
Manufacturer: MEMMERT  
**Date of Calibration:** 2 August 2021

Page 2 of 3

**Location:** Laboratory, SECOT CO., LTD.  
**Environment Condition:** Ambient Temperature ( 32 ± 1 ) °C  
Relative Humidity ( 60 ± 5 ) %  
Line Voltage ( 229 ± 1 ) Volt

### Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.  
- The temperature scale used was based on ITS - 90.  
- All data show below were final values and the initial data may be obtained upon request.
- Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 640400-01	24 April 2022	NATIONAL FOOD INSTITUTE
	RTD	CH#201-209/ RTD#201-209			

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated Item : Good

### UUC Description :

Time of Record 1 Hour 9 Minute At 20.0 °C

Fresh air Damper ☐ Open Position ☐  
☒ Close  
☐ Not Available

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

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Tel : +66 (0) 2422 8588 Fax : +66 (0) 2422 8588 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## Calibration Report

**Certificate No.:** 2104065-002-01  
**Equipment:** CHAMBER (Incubator)  
Model: ICP 400 Serial No.: K406.0004  
Resolution: 0.1 °C ID No.: N/A  
Manufacturer: MEMMERT  
**Date of Calibration:** 2 August 2021

Page 3 of 3

**Calibration point:** 20.0 °C

### Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	30.9	55	228.8
MAX	31.9	65	230.1

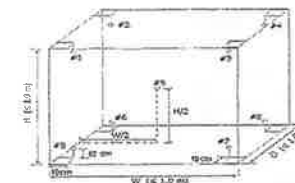


Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
20.0	19.99	20.07	20.13	20.03	20.05	19.98	20.00	20.06	20.02	0.27

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
20.0	20.0	20.0	20.0	0.062	0.12	0.27

**Note** The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC\* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

----- End -----

AT



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

Customer : บริษัท ซีคอต จำกัด Date Tested: June 16, 2022  
 Address : 239 ถนนริมคลองประปา Recommendation Recertification  
 แขวงบางซื่อ เขตบางซื่อ Period 6 Months  
 กรุงเทพฯ 10800 Recertification Due: December 15, 2022  
 User Name: คุณ อารยา Date Last Certified: December 16, 2021  
 Phone: 02-9593600 ext. 507 Visit Number: 1 OF 2  
 E-mail: labmail@secot.co.th TH Onesource Phone: 081-7316733  
 E-mail: thonesource@gmail.com

**CONFIGURATION TESTED**

MODEL	SERIAL NUMBER	SOFTWARE
AA-3110	311N6062102	AAWINLAB 3.2
HGA 600	2698	
AS 60	2124	
FIAS 100	1114	
AMALGAM	160S2110102	

TEST STANDARD USED	PART NUMBER
Copper	N9300183
GFAAS Mixed STD	N9300244
PE standard of Mercury	N9300174



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

SERIAL NUMBER 311N6062102

DATE TESTED June 16, 2022

**1. OPTIC CHECKS**

- A. Optical alignment condition (if necessary) ☐ OK  
 B. Condition of Mirrors, Lenses etc. ☐ OK  
 C. D2 and HCL beam adjust (if necessary) ☐ OK

**2. ELECTRONICS CHECKS**

- A. Power Supplies
- |                       |            |
|-----------------------|------------|
| + 5.00 Vdc ± 0.2 Vdc  | + 5.0 Vdc  |
| + 11.50 Vdc ± 0.2 Vdc | + 11.4 Vdc |
| + 15.00 Vdc ± 1.0 Vdc | + 15.2 Vdc |
| - 15.00 Vdc ± 1.0 Vdc | - 14.9 Vdc |
- B. D2 Power supplies
- |           |        |
|-----------|--------|
| +150 Vdc  | NA Vdc |
| + 450 Vdc | NA Vdc |
- C. PMT Power supply
- |           |            |
|-----------|------------|
| - 250 Vdc | -249.0 Vdc |
|-----------|------------|

**3. GAS SYSTEM CHECKS**

- A. Leak test all internal and external gas box joints ☐ OK  
 B. All gas box safety features ☐ OK  
 C. Burner system including nebulizer and all o-ring and gasket ☐ OK  
 D. Drain system ☐ OK

**4. FIAS CHECK**

- A. Output power supplies
- |                     |           |                     |            |
|---------------------|-----------|---------------------|------------|
| +5 VDC. ± 0.25 VDC. | 5.01 VDC. | +40 VDC. ± 0.5 VDC. | 40.02 VDC. |
|---------------------|-----------|---------------------|------------|
- B. Valve and pump clean ☐ OK



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

SERIAL NUMBER 311N6062102DATE TESTED June 16, 2022**5. PERFORMANCE TEST FOR FLAME**

A. Optical Filter 0.2 % Abs At 324.8 nm  $\pm$  10 % (SPEC.= 0.1713) 0.174 Abs.  
 B. Performance Tests with PE standard.  
 B1. Run Std. Of Cu and Cr at 324.8 ; 357.9 nm, Concentration 4, 4 ppm respectively  
 Results = 0.222, 0.228 Abs, with flow spoiler. respectively  
 Characteristic Concentration 0.079 ; 0.077 mg/L respectively  
 B2. Run Std. of Pb at 283.3 nm; Concentration 20 ppm  
 Results = 0.1960 Abs, with flow spoiler.  
 Characteristic Concentration 0.449 mg/L  
 C. Performance Tests (For C<sub>2</sub>H<sub>2</sub> + N<sub>2</sub>O Flame)  
 Run Std. Of Al at 309.3 nm; Concentration 50 ppm  
 Results = 0.237 Abs, with flow spoiler.  
 Characteristic Concentration 0.928 mg/L

**6. PERFORMANCE TEST FOR FIAS**

A. Characteristic mass for Mercury  
 ( 500 ul of 10 ug/l Hg for 0.07 Abs. ) 0.077 Abs.  
 Characteristic Mass 314 pg / 0.0044 Abs. 285.7 pg/0.0044 Abs.  
 RSD  $\leq$  2% 0.62 %  
 B. Characteristic mass for Arsenic  
 ( 500 ul of 10 ug/l As for 0.45 Abs. ) 0.468 Abs.  
 Characteristic Mass 48 pg / 0.0044 Abs. 47.0 pg/0.0044 Abs.  
 RSD  $\leq$  2% 0.83 %  
 C. Characteristic mass for Mercury Amalgamation  
 ( 1000 ul of 1.0 ug/l Hg for 0.03 Abs. ) 0.029 Abs.  
 Characteristic Mass 147 pg / 0.0044 Abs. 151.7 pg/0.0044 Abs.  
 RSD  $\leq$  2% 1.71 %



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

SERIAL NUMBER 311N6062102DATE TESTED June 16, 2022

Remarks :

NA Mean no applicant

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.

**TH ONE SOURCE CO., LTD.**Krungchai T.

Krungchai Treevichien )

Customer Support Engineer





**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

<b>SERIAL NUMBER</b> 311N6062102	<b>DATE TESTED</b> June 16, 2022	
<b>7. PERFORMANCE CHECK FOR FURNACE</b>		
A. Internal & External gas flow		<input type="checkbox"/> OK
B. Contract Cylinder ( replace if necessary )		<input type="checkbox"/> OK
C. Quartz Windows		<input type="checkbox"/> OK
D. Gas Tubing and Joins		<input type="checkbox"/> OK
E. Cooling System		<input type="checkbox"/> OK
<b>8. AUTOSAMPLER CHECK</b>		
A. Arm and gears		<input type="checkbox"/> OK
B. Sample and Rinse Pump		<input type="checkbox"/> OK
C. Tray and Sensors		<input type="checkbox"/> OK
<b>9. PERFORMANCE TEST FOR FURNACE</b>		
<b>Test run using Chromium</b>	<b>ACTUAL VALUE</b>	
1. Standard Deviation after 5 replicates of blank $\leq 0.005$	0.001	
2. Characteristic mass ( 5 ug / L for Cr, 3 pg/0.0044 A-s )	2.8	pg / 0.0044 A-s
Peak Area	0.155	A-s
Relative Standard Deviation $\leq 2\%$	1.03	%
<b>Test run using Lead</b>		
Characteristic mass ( 20 ug / L for Pb, 10 pg/0.0044 A-s )	9.4	pg / 0.0044 A-s
Peak Area	0.188	A-s
Relative Standard Deviation $\leq 2\%$	1.24	%

## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results. Delivered by highly-trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.agilent.com/en-us/services/analytical-instrument-services>

### Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- For customers using HF applications, the instrument should be returned to its standard sample introduction system.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional

### Service Engineer's Responsibilities

- Only complete/printout pages that relate to the system being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓" in the checkbox.
- Complete Not Applicable check boxes to indicate services not delivered, as needed.
- Complete the PM service in the order of the tasks listed.
- Complete the Service Review section together with the customer.

## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

### System Information

Instrument system name and ID	JCP 5110 VDV / MY16230003
Instrument system site and location	SECOT / 5th Fl Laboratory
List system component product numbers	List the serial numbers of each component
1. G 8015 A	1. MY16230003
2. G 8410 A	2. AU16181341
3. G 8475 A	3. MY16250001
4. G 8481	4. JB1641345
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

ICP-OES Configuration table	Circle the type or write in the type if other
Nebulizer Type	SeaSpray   OneNeb   other
Spray Chamber	Cyclonic Single Pass   Cyclonic Double Pass   other
Torch	Radial   Dual View   other
Injector Diameter	2.4mm   1.8mm   1.4mm   0.8mm   other
Injector Material	Quartz   Ceramic   other



## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

### General Preparation

- ☒ Discuss any specific questions or issues with the customer prior to starting.
- ☒ Review the instrument logbook.
- ☒ Perform general external inspection of system for cleanliness.
- ☒ Check for proper installation of safety-related parts, assemblies, sensors etc.
- ☒ Check for required firmware/software updates and verify with customers if they would like it installed.
- ☐ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it. N/A
- ☒ Run Instrument Performance test and record results in Instrument Performance Test Results Table - Pre PM.

### Inspect and clean the system

- ☒ Look for any obvious external damage or problems.
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☐ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☒ Replace the polychromator purge filter.
- ☐ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVDV and VDV instruments.
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☒ Replace air inlet dust filter.
- ☐ Replace high capacity air inlet dust filter element if installed. N/A
- ☒ Remove and clean instrument water inlet filter.

### G8481A Cooling water system

- ☐ Section NOT Applicable
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Remove, clean and reinstall water inlet metal mesh filter.
- ☒ Re fill with Polyclear cooling fluid
- ☒ Clean the cooling system Air filter and the condenser by compressed air or vacuum cleaner.



## Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

### SPS 3 Auto Sampler

- ☒ Section NOT Applicable
- ☐ Power cycle the autosampler and verify successful initialization.
- ☐ Inspect X and Z axis belts for wear. Replace is necessary.
- ☐ Clean X and Z axis slide shafts.
- ☐ Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial.

### SPS 4 Auto Sampler

- ☐ Section NOT Applicable
- ☒ Clean the spill tray, rack location mat, end frames and chassis with a damp soft cloth and diluted mild detergent.
- ☒ Clean the auto sampler cover panels, if cover kit is installed, with domestic window cleaner
- ☒ Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☒ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- ☒ Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles

### AVS 4, 6, 7

- ☒ Section NOT Applicable
- ☐ Replace valve rotor seal
- ☐ Check fittings for signs of leaks
- ☐ Check tubing including autosampler tubing for kinks or excessive wear
- ☐ Check high flow pump for signs of leaks

### Instrument Adjustment

- ☒ Check position of Zn peak, adjust if required.
- ☒ Check Argon Ratio, adjust to specified value if required.
- ☒ Perform Detector Calibration.
- ☒ Perform Instrument Calibration.
- ☒ Run Instrument Performance Test and record results in Instrument Performance Test Results Table - Post PM.
- ☒ For systems using ICP Expert version 7.3 and above run the following Instrument tests and record the result in the Instrument Test Results Table
  - ☒ Subsystem Communications Test
  - ☒ Air Flow

### Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

- ☒ Water Flow
- ☒ Gas Flows
- ☒ RF Generator
- ☒ Camera Test
- ☒ Optics Test
- ☒ Nebulizer Test

### Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial *	Radial	Axial *
Zn 213.857 nm SRBR	2956.3	7710.7	2822.9	7221.7
Mn 257.610 nm SRBR	8019.4	24552.7	7232.9	22099.7
Al 396.152 nm SBR	9.8	22.0	9.1	20.7
K 766.491 nm SBR	4.6	63.8	4.0	55.7

\* Axial result is not applicable for G8016AA, G8012AA Radial View instruments.

### Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flows	Pass
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer test	Pass

### Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

### ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

Measurement	Standby Mode		Plasma On	
Mains Voltage	219.56	VAC	218.1	VAC
Mains Current	0.111	A	0.128	A
Instrument Temperature	25.7	°C	25.3	°C
RF Air Flow (sensor speed)	13.0	Hz	18.0	Hz
Plasma Exhaust Temperature	No measurement		56.4	°C
Water Flow Oscillator	No measurement		1.40	L/min
Water Flow Detector	1.28	L/min	1.24	L/min
Water Inlet Temperature	18.9	°C	20.6	°C
Polychromator Temperature	35.0	°C	35.0	°C
CCD Temperature	-39.8	°C	-39.8	°C
Thermal Stabilizer	35.0	°C	35.0	°C
Argon Supply Pressure	605.60	kPa	541.94	kPa
Purge Gas Supply Pressure*1	602.97	kPa	571.75	kPa
Option Gas Supply Pressure*1	N/A	kPa	N/A	kPa
Nebulizer Flow	No measurement		0.70	L/min
Nebulizer Back Pressure	No measurement		300.68	kPa
Plasma Gas Flow	No measurement		12.00	L/min
Auxiliary Gas Flow	No measurement		1.00	L/min
RF Power	No measurement		1200	W
RF Supply Current	No measurement		8.213	A
RF Supply Voltage	No measurement		194.700	V

\*1 If option installed

**Agilent 5110 and 5100 ICP-OES  
Preventive Maintenance Checklist**
**ICP-OES Parts List Table**

Part description	Part Number	Product /Model # where used	Quantity Consumed
Axial Pre-Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8015A	1
Radial Pre-Optic Window	G8010-68015	All	1
Polyclear Cooling Fluid	G3292-80010	G8481A	1
Purge Gas Filter	G8010-60186	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	1
Rotor seal for 6-7 port valve for AVS6/7	G8494-60002	G8494A/G8495	1
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	1
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	1
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	1
PVC waste tubing, 8mm od x 5mm id, 2m	G8410-80122	SPS 4	1
<b>Additional Parts may be required from engineers stock:</b>			
X axis drive belt	5410047500	SPS 3	1
Z axis drive belt	5410047400	SPS 3	1
Peristaltic pump tubing, PVC SolvaFlex, 3 bridged,	3710049000	SPS 4	1

**Restore system**

For HF applications, ask the customer to reinstall their sample introduction system.

Leave system in an idle state: on and purging.

Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

**Service Review**

- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☐ Complete the Service Engineer Comments section below if there are additional comments.

**Agilent 5110 and 5100 ICP-OES  
Preventive Maintenance Checklist**

- ☒ Review the service and any test results with the customer.
- ☐ If the Instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

**Service Engineer Comments (optional)**

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

**Other Important Customer Web Links**

How to get information on your product:

- ☐ Literature Library - <http://www.agilent.com/en-us/products/icp-oes/icp-oes-systems/5110-icp-oes#literature>
- ☐ Need to know more? - <http://www.agilent.com/crosslab/university/>
- ☐ Need technical support, FAQs? - <http://www.agilent.com/en-us/support/landing/icp-oes>
- ☐ Need supplies? - [www.agilent.com/chem/supplies](http://www.agilent.com/chem/supplies)

**Service Completion**

Service request number 6004692409 Date service completed 29 July 2021

Agilent signature Wojanik T. Customer signature \_\_\_\_\_

Document part number: G8014-90075

## Agilent CrossLab Start Up Services

### Agilent 7890 Gas Chromatograph

### Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the preventive maintenance activities.

## Introduction

### Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

### Important Customer Web Links

- For more information about **Agilent Technologies services**, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful **Agilent Resource Center** web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>.
- Need technical support, FAQs, supplies? – visit our **Support Home page** <http://www.agilent.com/search/support>.
- **Videos** about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- **7890B Manuals** are also available on Agilent.com:
  - **Safety**  
[https://www.agilent.com/cs/library/usermanuals/public/7890B\\_Safety.pdf](https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf)
  - **Installation and First Startup**  
[https://www.agilent.com/cs/library/usermanuals/Public/7890B\\_Installation.pdf](https://www.agilent.com/cs/library/usermanuals/Public/7890B_Installation.pdf)
  - **Operation Manual**  
[https://www.agilent.com/cs/library/usermanuals/Public/7890B\\_Operation.pdf](https://www.agilent.com/cs/library/usermanuals/Public/7890B_Operation.pdf)
  - **Maintaining Your GC**  
[https://www.agilent.com/cs/library/usermanuals/public/G3430-90052%207890B\\_Maintaining%20Guide.pdf](https://www.agilent.com/cs/library/usermanuals/public/G3430-90052%207890B_Maintaining%20Guide.pdf)

## Service Engineer's Responsibilities

- **Contact** the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check **"Section not applicable"** check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- **Ask the customer to sign the Service Completion section including the customer's and your signature.**

## Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

## System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table below.

Instrument System Name and ID	7890A GC System / GCMS
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Instrument System Site and Location	SECOT Co., Ltd.
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### List System Component Product Numbers

### List the Serial Numbers of each Component

1. G3440A	CN10750035
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

*N/A*  
*Sign T*

## Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes.
- ☒ Check for required firmware updates and verify with customers if they would like them installed.
- ☐ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

## Preventive Maintenance Procedure

### Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ **Inspect internal connectors for proper contact and placement.**
- ☒ **Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.**
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

### Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 7890 manual – "Maintaining Your GC" - for the inlet(s) installed.
- ☒ **Replace the split vent trap cartridge filter on units with these inlets: Split/Spiltless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).**
- ☒ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
- ☐ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

### Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 7890 "Advanced User Guide".
- ☒ Perform inlet pressure decay test(s) as defined in the 7890 "Troubleshooting Manual".  
If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

## ALS Maintenance

- ☒ **Section NOT applicable**
- ☐ Check all cabling and configuration settings between GC, tray, and injectors.
- ☐ Vacuum or remove any dust, especially around fans.
- ☐ Check operation of all fans.
- ☐ Check syringe for smooth plunger operation.
- ☐ Check for smooth operation of the needle support – clean if necessary

## Restore Instrument

- ☒ Restore the normal operating conditions or customer method using the Data System.
- ☒ Purge the system with carrier flow for 15 minutes
- ☒ Bake out the system, then restore the normal operating conditions
- ☒ After equilibration, check and record the post PM detector signal output values.  
Results should be similar or lower than the detector outputs recorded prior to PM.
- ☒ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.



## Signature Page

### Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review with the customer this service, parts replaced, and test results obtained.
- ☐ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.
- ☐ Supply the customer with a copy of the Smart Alerts flyer.
- ☐ Describe Smart Alerts to the customer.
- ☐ Install Smart Alerts if requested.

### 7890 GC Test Results Table

Detector Signal Outputs	Before PM Service	After PM Service
Front detector output	N/A	N/A
Back detector output	N/A	N/A
AUX detector output	N/A	N/A
Pressure decay test	Expected test result	Actual test result
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test	Pass	Pass

## 7890 Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

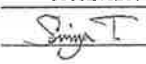
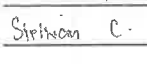
Part description	Part number	Product or model# where used	Quantity consumed
SSL Capillary Inlet PM kit, Splitless	5188-6497	7890A/B	1
SSL Capillary Inlet PM kit, split	5188-6496	7890A/B	1
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	7890A/B	N/A
PP Inlet PM kit	5188-6498	7890A/B	N/A
Split vent trap PM kit, single cartridge (for MMI, PTV & VI)	5188-6495	7890A/B	N/A
MMI Cleaning Kit	G3510-60820	7890A/B	N/A
PTV Septumless Head Rebuild Kit	5182-9747	7890A/B	N/A
PTV Septumless Head Teflon Guide	5182-9748	7890A/B	N/A
Ignitor (glow plug) assembly with O-ring	19231-60680	7890A/B	N/A
FID Collector Rebuild/Cleaning Kit	G1531-67000	7890A/B	N/A
Standard .011-inch FID Jet for capillary FID base	G1531-80560	7890A/B	N/A
High Temperature .018-inch FID Jet for capillary FID base	G1531-80620	7890A/B	N/A
Standard .018-inch FID Jet for packed column with packed FID base	18710-20119	7890A/B	N/A
Standard .011-inch FID Jet for capillary column with packed/adaptable FID base	19244-80560	7890A/B	N/A
High Temperature .018-inch FID Jet for capillary column with packed/adaptable FID base	19244-80620	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID	G1534-80580	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID Extended tip	G1534-80590	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
**FID Collector Replacement Kit, if needed	G1531-67001	7890A/B	N/A

## Service Engineer Comments

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write include them in this box.

N/A

## Service Completion

Service request number 6005218299 Date service completed 17 JUN, 2022  
 Agilent signature  Customer signature   
 Total number of pages in this document 10

Do not include this section/page in the published, customer-facing PDF version.

This page is only relevant for Agilent source documents for document control purposes and is NOT intended for customer viewing. Refer to the SPIFPM checklist Authoring Guide for more information.

## Document Control Logs

## Revision Log

Revision	Date	Author	Reason for update
Revision of document	Date of issuance	Author of document	Author to describe main features/changes made for this specific revision
1.0 Draft	4-Mar-2011	Dave Park	Migrated the content of revision A.01.05 to the new Agilent template. Reviewed by subject matter expert, Dave Park.
1.1 Draft	20-Jan-2015	Dave Park	Added Split Vent trap to MMI, PTV and VE - also PTV and FID PM Parts
1.2 Draft	31-March-2015	Dave Park	Added Ultra Inert Gold Seal and Liner to SS Consumables
A.01.11	10-Dec-2015	Dave Park	Added step to perform maintenance on the Split Vent Tube and .018" FID Jet part numbers - Fixed broken web links
2.00	30-Dec-2020	Gary Boardman	Updated New Template and terminology change: Familiarization to Introduction. Create New Agile Document Number: D0007063

## Approval Log

Revision	Approver	Title of approver
Add revision number	Add approver name here	Add approver's function or title here
A.01.06	Don Gage	Product support manager
A.01.09	Kai Meng	Product support manager
A.01.10	Suneetha Tippireddy	Product support manager
A.01.11	Suneetha Tippireddy	Product support manager
2.00	Josh Roark	GC Product Support Manager

## Designated Evaluation Log

Revision	Designated Evaluator (DE)	Title of DE	DE Number
Add revision number	Add name	Add function or title	Add DE number here
2.00	Michael Zumwalt	CrossLab Start Up Services Application Consulting Lead	44166.759722222

## Agilent CrossLab Start Up Services

# Agilent GCMS Preventive Maintenance Checklist

## Introduction

Select the appropriate PM to be done and then perform the checklist under that section

- ☐ Interim Preventive Maintenance 6 months  
☒ Major Preventive Maintenance Yearly

This checklist covers the following model(s):

Type	Model
SQ	5973 Series MSD
SQ	5975 Series MSD
SQ	5977 Series MSD
TQ	7000 Series MS/MS
TQ	7010 Series MS/MS
QTOF	7200 Series QTOF
QTOF	7250 Series QTOF

## Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

### Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>
- Need technical support, FAQs, supplies? – visit our Support Home page at <http://www.agilent.com/search/support>
- Get answers. Share insights. Build connections:  
Join the Agilent Community at <https://community.agilent.com/welcome>

### Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Ask the customer to sign the Service Completion section including the customer's and your signature.

### Additional Instruction Notes

- Preventive maintenance is a factory recommended procedure designed to reduce the likelihood of electromechanical failures. Failure to perform preventive maintenance may reduce the long-term reliability of certain instruments and systems. **Two preventative maintenances (PMs) per year are recommended, the Major PM Service will be performed annually with an Interim PM performed 6 months after the Major PM.**

### System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	5975C MSD / GCMS-FID
Instrument System Site and Location	SECOT Co., Ltd.

List System Component Product Numbers	List the Serial Numbers of each Component
1. G3172A	US74838080
2.	
3.	
4.	
5.	
6.	
7.	
8.	

### Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and settings as defined by current Service Notes
- ☒ Check for firmware updates and verify with customers if they would like them installed. Firmware update(s) are strongly recommended.

### Customer Responsibilities

Customers should ensure that all necessary operating supplies, consumables, and usage-dependent items such as gases, vials, syringes, calibrant solution and solvents required for successful preventive maintenance are available. A customer representative should be available while the preventive maintenance is being performed.

## Important notice for customers

The customer should complete the following before the Support Provider arrives on site:

- ✓ Perform an autotune and retain the printed tune report just prior to the start of the PM to verify performance of the equipment.

**Note:** it is recommended to have the customer run the autotune and tune evaluation prior to the PM and then start the vent cycle so that the instrument will be ready for the service representative.

## Definition of the Task/Recommended items within the document

Task	Recommended	
Yes	No	Interim / Major / As needed
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Yes** selected means that the task was done or the part was required.

**No** selected means that the task was not done or the part was not required.

**Interim** selected means that this task is recommended to be done at 6-month intervals.

**Major** selected means that this task is recommended to be done yearly; if the customer would like a service to be done at the 6-month interval then the service could be purchased.

**As needed** selected means that the task was done or the part was used as needed. For example, there could be two types of filters that could be used and this was the one selected.

## Preventive Maintenance Procedures

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Perform general inspection of system for cleanliness
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Discuss any problems the customer is having with the instrument
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Review customer maintenance records and exclude maintenance on recently serviced items
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Review the most recent autotune report. This will give a starting point for evaluating spectral peaks, baseline noise, peak shape, mass assignments and resolution.

Yes/No	Interim/Major	GCMS
Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Record instrument model no.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Record instrument serial no.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Record Rough Vacuum
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Record Manifold Vacuum
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Type of Column installed

Yes/No	Interim/Major	System Checks
Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Verify that calibration peaks were seen prior to starting the PM
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Vent the instrument
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inspect vacuum hoses, pump, exhaust tubing, and power cords for excessive wear.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Visually inspect calibrant levels – PFTBA PFTD (if appl.), IRM (if appl.). Refill if available.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Look for any obvious external damage or problems.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Clean air intake(s). Cosmetic cover(s) may need to be removed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Verify system line voltage meets instrument specifications: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Yes/No	Interim/Major	Wet Mechanical vacuum pumps
Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check for evidence of oil leakage. Check pump gasket for leakage.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Drain and replace mechanical pump oil.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace Oil Mist Filter if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Discuss with customer the need for more frequent oil changes if the oil is dirty.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Don't use mist filters with Chemical Ionization.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed. Visually confirm that no oil returns up vacuum hose.
Yes/No	Interim/Major	Dry Mechanical vacuum pumps - Diaphragm
Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Clear air flow paths of dust.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	If vacuum is poor, then replace the diaphragm pump.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

Yes/No	Interim/Major	Dry Mechanical vacuum pumps - Scroll
Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace the tips seal on the IDP pump.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace the Exhaust Filter if required.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Discuss with customer the need for more frequent changes, if needed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inform customer that pump gas ballast should be installed all the time.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

Yes/No	Interim/Major	Cleaning System and Filters
Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Fans
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Remove dust from fans and vent covers.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Verify fans are functional and that there is enough space around the instrument for proper cooling.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Source cleaning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Open analyzer and remove the source.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Disassemble, Clean, Re-assemble source.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Re-install source and close analyzer.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Filters
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace RMSH-2 Helium gas filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace RMSN-2 Nitrogen gas filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Replace RMSHY-2 Hydrogen gas filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CP17988 – Gas Clean Carrier Gas Kit for 7890 for Nitrogen or Helium, Bracket, Mount, and Filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CP17974 – Gas Clean Filter Kit GC/MS 1/8" Mount and Filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CP17973 – Gas Clean Filter Replacement Filter – if applicable.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5190-9071 – Methane Gas Filter – if applicable.

**Guidance:** If gas filter is replaced, write the change date on the filter using a permanent marker.

System post-check			
Yes/No	Interim	Major	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Pump system back down. Wait until system stability has been achieved.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system vacuum reading(s) via the gauge controller.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Leak Check
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system in manual tune
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Compare against previous tune file report(s)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Change to Tune and verify that all temperatures, pressures, and gas flows reach method set points
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check manually that you have calibration peaks.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	E) Autotune Performed

**Guidance:** If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument setup and checkout.

## Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook. Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☐ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comment box. Systems in a compliant environment may need additional documentation.

### Agilent Test Results Table

[illegible]

### Agilent Consumed Parts List Table

☐ Section not applicable[illegible]

## Signature Page

### Service Engineer Comments (optional)

N/A

### Service Completion

Service request number 6005218299 Date service completed 17 JUN, 2022

Agilent signature Simon T. Customer signature Simon C.

Total number of pages in this document 12