



ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือวิเคราะห์

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศในบรรยากาศ		
TSP	High Volume Air Sampler No. B21, B24, B32, B44	Digital Balance
PM ₁₀	High Volume PM ₁₀ Air Sampler No. B02, B07, B15, B30	Digital Balance
2. ระดับเสียง		
ระดับเสียงในบรรยากาศ L _{eq} 1 hr, L _{eq} 24 hr, L _{max} และ L ₉₀	Acoustic Calibrator Sound Level Meter ACO No. B08, B12	-
ระดับเสียงจากเครื่องจักร/เครื่องมือ L _{eq} 15 min และ L _{max}	Acoustic Calibrator Sound Level Meter ACO No. B07	-
3. คุณภาพน้ำ		
Temperature	-	Thermometer
Color	-	Spectrophotometer
pH	-	pH Meter
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
Grease & Oil	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Nitrate-Nitrogen	-	Spectrophotometer
Phenols	-	Spectrophotometer
Formaldehyde	-	Spectrophotometer
Cyanide as Hydrogen Cyanide	-	Spectrophotometer
Arsenic	-	AAS
Selenium	-	AAS
Barium	-	ICP
Cadmium	-	ICP
		AAS
Copper	-	ICP
		AAS
Total Iron	-	ICP
Manganese	-	ICP
		AAS
Zinc	-	ICP
		AAS

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
3. คุณภาพน้ำ (ต่อ) Nickel	-	ICP
		AAS
Lead	-	ICP
		AAS
Mercury	-	AAS
Silver	-	ICP
Hexavalent Chromium	-	Spectrophotometer
Total Coliform Bacteria	-	Incubator
Fecal Coliform Bacteria	-	Water Bath
Total Organochlorine Pesticides	-	GC/MS

คุณภาพอากาศในบรรยากาศ

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard			Model : TE 5025A	S/N : 3611
Calibration Data				
High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (l/min)	R ²
B01	B01	01/08/2023	y = 1.289x - 5.689	0.999
B02	B02	02/08/2023	y = 1.106x - 2.866	0.999
B03	B03	01/08/2023	y = 1.126x - 0.852	0.997
B04	B04	01/08/2023	y = 1.294x - 8.235	0.996
B05	B05	04/08/2023	y = 1.279x - 7.416	0.996
B06	B06	01/08/2023	y = 1.280x - 7.019	0.999
B07	B07	01/08/2023	y = 1.250x - 6.249	0.998
B08	B08	01/08/2023	y = 1.268x - 7.621	0.999
B09	B09	01/08/2023	y = 1.288x - 5.982	1.000
B10	B10	04/08/2023	y = 1.142x - 0.294	0.999
B11	B11	04/08/2023	y = 1.165x - 3.050	0.998
B12	B12	04/08/2023	y = 1.227x - 5.594	0.999
B13	B13	04/08/2023	y = 1.282x - 7.822	0.998
B14	B14	04/08/2023	y = 1.296x - 7.713	0.998
B15	B15	02/08/2023	y = 1.176x - 3.322	0.997
B16	B16	02/08/2023	y = 1.316x - 9.126	0.997
B17	B17	02/08/2023	y = 1.235x - 6.894	1.000
B18	B18	02/08/2023	y = 1.322x - 10.529	0.998
B19	B19	02/08/2023	y = 1.277x - 8.109	0.997
B20	B20	02/08/2023	y = 1.297x - 8.466	0.998
B21	B21	03/08/2023	y = 1.186x - 3.582	1.000
B22	B22	03/08/2023	y = 1.274x - 8.729	0.998
B23	B23	03/08/2023	y = 1.224x - 5.660	0.995
B24	B24	03/08/2023	y = 1.185x - 3.773	0.999
B25	B25	01/08/2023	y = 1.075x - 1.295	0.998
B26	B26	01/08/2023	y = 1.232x - 7.798	0.997
B27	B27	01/08/2023	y = 1.248x - 7.406	0.997
B28	B28	01/08/2023	y = 1.278x - 8.370	0.999
B29	B29	04/08/2023	y = 1.292x - 7.541	0.999
B30	B30	04/08/2023	y = 1.270x - 8.142	0.995
B31	B31	04/08/2023	y = 1.284x - 8.212	0.999
B32	B32	04/08/2023	y = 1.294x - 8.759	0.999
B33	B33	04/08/2023	y = 1.252x - 6.024	0.999
B34	B34	04/08/2023	y = 1.262x - 7.362	0.998

Calibrated by : Adul Dangtham (Mr. Adul Dangtham)
Approved by : Peera Detudom (Mr. Peera Detudom)

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard			Model : TE 5025A	S/N : 3611
Calibration Data				
High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (l/min)	R ²
B35	B35	03/08/2023	y = 1.231x - 4.116	0.995
B36	B36	03/08/2023	y = 1.247x - 6.537	0.999
B37	B37	03/08/2023	y = 1.313x - 8.352	0.997
B38	B38	03/08/2023	y = 1.279x - 8.340	0.996
B39	B39	03/08/2023	y = 1.286x - 6.520	0.998
B40	B40	03/08/2023	y = 1.241x - 6.104	1.000
B41	B41	03/08/2023	y = 1.203x - 4.349	0.999
B42	B42	03/08/2023	y = 1.296x - 8.828	0.999
B43	B43	04/08/2023	y = 1.345x - 5.710	0.997
B44	B44	04/08/2023	y = 1.262x - 5.417	0.999
R01	R01	04/08/2023	y = 1.285x - 8.953	0.999
R02	R02	04/08/2023	y = 1.288x - 8.283	0.998
R03	R03	04/08/2023	y = 1.283x - 9.563	0.999
R04	R04	04/08/2023	y = 1.234x - 5.231	0.999
R05	R05	04/08/2023	y = 1.303x - 10.503	0.999
R06	R06	04/08/2023	y = 1.287x - 7.927	0.997
R07	R07	04/08/2023	y = 1.084x - 0.577	0.999
R08	R08	04/08/2023	y = 1.304x - 9.887	0.998
R09	R09	04/08/2023	y = 1.286x - 8.387	0.998
R10	R10	03/08/2023	y = 1.241x - 6.099	0.996
R11	R11	03/08/2023	y = 1.112x - 1.473	0.998
R12	R12	03/08/2023	y = 1.250x - 6.933	0.997
R13	R13	03/08/2023	y = 1.142x - 2.460	0.998
R14	R14	02/08/2023	y = 1.295x - 3.813	0.998
R15	R15	01/08/2023	y = 1.160x - 3.516	0.999
R16	R16	01/08/2023	y = 1.229x - 7.416	0.998
R17	R17	01/08/2023	y = 1.209x - 4.806	0.996
R18	R18	01/08/2023	y = 1.257x - 6.979	0.999
R19	R19	01/08/2023	y = 1.256x - 7.676	0.998
R20	R20	01/08/2023	y = 1.279x - 8.603	0.998

Calibrated by : Adul Dangtham (Mr. Adul Dangtham)
Approved by : Peera Detudom (Mr. Peera Detudom)



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

High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

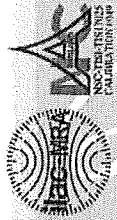
High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	03/08/2023	$y = 1.268x - 3.132$	0.995
B02	B02	01/08/2023	$y = 1.046x + 2.277$	0.999
B03	B03	01/08/2023	$y = 1.277x - 6.485$	0.998
B04	B04	01/08/2023	$y = 1.287x - 8.164$	0.999
B05	B05	01/08/2023	$y = 1.229x - 5.276$	0.998
B06	B06	01/08/2023	$y = 1.270x - 6.448$	0.997
B07	B07	03/08/2023	$y = 1.285x - 6.916$	0.998
B08	B08	01/08/2023	$y = 1.286x - 6.261$	0.998
B09	B09	03/08/2023	$y = 1.257x - 5.694$	0.997
B10	B10	03/08/2023	$y = 1.292x - 8.553$	0.996
B11	B11	03/08/2023	$y = 1.250x - 6.659$	0.998
B12	B12	02/08/2023	$y = 1.292x - 8.553$	0.996
B13	B13	02/08/2023	$y = 1.285x - 7.847$	1.000
B14	B14	02/08/2023	$y = 1.279x - 5.782$	0.999
B15	B15	02/08/2023	$y = 1.144x - 0.631$	0.999
B16	B16	02/08/2023	$y = 1.228x - 0.850$	0.995
B17	B17	01/08/2023	$y = 1.279x - 7.056$	0.997
B18	B18	01/08/2023	$y = 1.220x - 3.845$	0.998
B19	B19	01/08/2023	$y = 1.123x - 0.193$	0.999
B20	B20	03/08/2023	$y = 1.216x - 5.924$	0.999
B21	B21	03/08/2023	$y = 1.182x - 1.600$	0.996
B22	B22	03/08/2023	$y = 1.298x - 8.251$	0.998
B23	B23	02/08/2023	$y = 1.227x - 4.062$	0.999
B24	B24	02/08/2023	$y = 1.246x - 4.841$	0.999
B25	B25	02/08/2023	$y = 1.224x - 5.771$	1.000
B26	B26	01/08/2023	$y = 1.277x - 6.994$	0.998
B27	B27	04/08/2023	$y = 1.258x - 8.288$	0.999
B28	B28	04/08/2023	$y = 1.226x - 6.184$	0.998
B29	B29	04/08/2023	$y = 1.275x - 8.861$	0.999
B30	B30	03/08/2023	$y = 1.308x - 9.003$	0.999
B31	B31	03/08/2023	$y = 1.205x - 1.680$	0.995
B32	B32	03/08/2023	$y = 1.229x - 4.453$	0.998
B33	B33	03/08/2023	$y = 1.273x - 7.576$	0.996
B34	B34	03/08/2023	$y = 1.268x - 3.565$	0.997

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


Peera Detudom
(Mr. Peera Detudom)

CERTIFICATE No : 23M2441
REFERENCE No : 68471-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 10-Mar-23
APPROVED BY :  PONGSAK J.
ISSUED DATE : 16-Mar-23
RECEIVED DATE : 10-Mar-23

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

CERTIFICATE No : 23M2441

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
ID No : BA 05/50
AIR PRESSURE : 1010mbar ± 1mbar
AMBIENT TEMPERATURE : 23°C ± 1°C
MODEL : XS103DU
S/N : 1126422905
RECEIVED DATE : 10-Mar-23
CALIBRATION DATE : 10-Mar-23
RELATIVE HUMIDITY : 49%RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 62019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS. EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-1-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

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

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

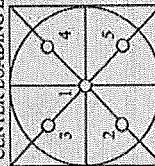
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.2

4. DEPARTURE FROM NOMINAL VALUE / LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (±g)
0.00	0.00000	0.00000	0.000039
0.02	0.02000	0.00000	0.000039
0.10	0.10000	0.00000	0.000039
0.20	0.20001	-0.00001	0.000040
0.50	0.50001	-0.00001	0.000040
1.00	1.00000	0.00000	0.000041
2.00	2.00003	-0.00003	0.000042
5.00	5.00001	-0.00001	0.000046
10.00	10.00003	-0.00003	0.000053
20.00	20.00005	-0.00005	0.000067
50.00	50.00001	-0.00001	0.00011
100.00	100.00001	-0.00001	0.00019
200.00	200.00001	-0.00001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0001
3	50.0000
4	50.0000
5	49.9999
OFF-CENTER LOADING	0.0001

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

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

END OF CALIBRATION REPORT



ระดับเสียงในบรรยากาศ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL BP. 109/0366

CALIBRATION CERTIFICATE

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

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

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

: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

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

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

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

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

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

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

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

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

Date of Receipt : 27 Mar. 2023

Date of Calibration : 29 Mar. 2023

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

Head Office

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Chungchit Pattanathani 12120, Thailand
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Fax. (66) 0 2577 9009
E-mail : tumpat@tistr.or.th Website: www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2579 121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL BP. 109/0366

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

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

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

1. Sound Pressure Level

Standard Microphone	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit
Type	93.94	-0.06	± 0.10	IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180				±0.40 dB

2. Frequency

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

3. Total distortion

Standard Microphone	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit
Type	1.80	± 0.50	IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180			±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Signature)
(Mr. Weerachai Deechaiyae)

Approved by :

(Signature)
Director
(Mr. Praewade Klusapa)

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 29 Mar. 2023

Date of Issue : 30 Mar. 2023

Ref: 2011266032701228001

End of Certificate

2 / 2

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

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

Head Office

35 Mu. 3 Tambon Klongwa, Amphoe Khlong Luang,
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E-mail : sumalee@tistr.or.th

FMILMTC002 Rev.4



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

Noise B_394/23

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	29 March 2023
		Due Date	29 March 2024

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B07	ACO	6236	00142004	25 September 2023	93.9	94.0
ACO-B08	ACO	6236	00142008	25 September 2023	94.0	94.0
ACO-B12	ACO	6236	00152081	25 September 2023	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.94 ± 0.10 dB	

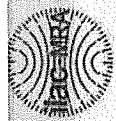
Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

คุณภาพน้ำ



Certificate of Calibration

Certificate No. : 66-400065-2

Page : 1 of 2

Submitted by :

S. P. S Consulting Service Co.,Ltd.

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatechak, Bangkok 10900

Equipment :

Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

Environment :

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received :

01 February 2023

Date of Calibration :

06 February 2023

Date of Issue :

06 February 2023

Calibrated by :

Chortip Samelhuai

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

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID.No. 400001 Cert.No. TT-0016-22 Due Date 07 Feb 2024

Traceability
National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID.No. 400003 Cert.No. 21E1850 Due Date 14 Jun 2023

Traceability
National Institute of Metrology Thailand (NIMT)
National Institute of Metrology Thailand (NIMT)

400004 21E1850 14 Jun 2023

Approved by :

(Bunjerd Mastr)

Supervisor

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 Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 66-400065-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function :

Temperature measurement

Ice point check : UUC* reading 0 °C Standard reading 0.3606 °C

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
20.3607	20	0.4	0.31

Remark

UUC : Unit Under Calibration

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

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

- ๐0๐ -





Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER
Manufacturer : PERKINELMER
Model : LAMBDA 25
Serial No.: 501514123010
ID No.: SP03/58
Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY
Condition As Found : GOOD
Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,
CHOMPON, CHATUCHAK,
BANGKOK 10900, THAILAND.
Location : ORGANIC LABORATORY IV
Ambient Temperature : (25.0 ± 5) °C
Relative Humidity : (48.4 ± 25) %
Received Date : 30 AUGUST 2023
Calibration Date : 30 AUGUST 2023
Date of Issue : 31 AUGUST 2023

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01
The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution
The calibration procedure used was based on ASTM E275-01, ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-INEN3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0090-22	08/04/2024

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

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

- 3.1 The UK National Physical Laboratory (NPL)
- 3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	k	Factor
RM-HL	278.13	278.3	0.17	0.16	2.00	2.00
	361.25	361.3	0.05	0.16	2.00	2.00
	467.82	468.0	0.18	0.16	2.00	2.00
	536.56	536.6	0.04	0.16	2.00	2.00
RM-DL	640.50	640.4	-0.10	0.16	2.00	2.00
	740.09	740.0	-0.09	0.16	2.00	2.00
	864.94	865.0	0.06	0.16	2.00	2.00

UUC* = Unit Under Calibration

T. Petchurai

Continuation of Calibration Certificate

Cert. No. : SP23016
Job No. : VC66SP0014
Pages : 3 of 3

Result of calibration : Photometric Accuracy
(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0564	0.0047	0.0031	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0032	2.00
		29381	0.5	0.5416	0.5429	0.0013	0.0032	2.00
	546.1	29360	1.0	0.9821	0.9849	0.0028	0.0030	2.00
		29914	0.7	0.6961	0.6961	0.0000	0.0030	2.00
Neutral Density glass filter	590.0	29381	0.5	0.5073	0.5073	0.0000	0.0030	2.00
		29360	1.0	1.0222	1.0244	0.0022	0.0030	2.00
		29914	0.7	0.7237	0.7234	-0.0003	0.0030	2.00
	635.0	29381	0.5	0.5361	0.5360	-0.0001	0.0031	2.00
		29360	1.0	0.9753	0.9775	0.0022	0.0030	2.00
RM-0204060810	235.0	29914	0.7	0.6910	0.6910	0.0000	0.0030	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
		29360	1.0	1.0222	1.0244	0.0022	0.0030	2.00

UUC* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S141230

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.0001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	1100 nm-190 nm
Scanning Speed	7.5 nm/min
Data Pitch	0.1 nm
Band width(Wavelength)	1.0 nm
Band width(Vis)	1.0 nm
Band width(Uv)	1.0 nm

**Specific Acceptance :

Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A

**Stray light not TISI Accredited

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

End of Calibration Certificate



QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584



CERTIFICATE No.: 23E8494
REFERENCE No.: 70413-1

PAGE: 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : HANNA
MODEL : HI 3512
SERIAL No : TH118035
ID No : pH04/56
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 06-Sep-23
APPROVED BY :
PONGSAK J.
ISSUED DATE : 06-Sep-23
RECEIVED DATE : 31-Aug-23

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

F-G010 REV 03



QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No.: 23E8494

PAGE: 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : HANNA
ID No : pH04/56
RECEIVED DATE : 31-Aug-23
AMBIENT TEMPERATURE : 23 °C ± 3 °C
MODEL : HI 3512
SERIAL NUMBER : TH118035
CALIBRATION DATE : 06-Sep-23
RELATIVE HUMIDITY : 50 % RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

INSTRUMENT	MODEL	SERIAL No/	CERTIFICATE No	DUE DATE
1) pH STANDARD SOLUTION	00651-06	CC767907	4880-13836406	29-Dec-24
2) pH STANDARD SOLUTION	00651-08	CC765602	4881-13757019	18-Nov-24
3) pH STANDARD SOLUTION	00651-10	CC767180	4882-13813369	14-Dec-24
4) PROCESS CALIBRATOR	CA150	91S6079	23E1312	19-Apr-24
5) BATH	260014	1247 48074	22T9870	13-Sep-23
6) THERMOMETER WITH PROBE	421504	55000379	22T9904	13-Sep-23

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

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

5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-

- NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

SLOPE FACTOR k = 2.303 RT/F = 59 mV/pH

SLOPE FACTOR K = 2.303 R/T F = 59 mV/pH									
APPLIED mV		UUC READING (mV)		CORRECTION (mV)		UUC READING (pH)		UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11		414.6		-0.49		-0.290		0.15	2.00
354.95		355.4		-0.45		0.741		0.15	2.00
295.80		296.3		-0.50		1.773		0.15	2.00
236.64		237.1		-0.46		2.804		0.15	2.00
177.48		177.9		-0.42		3.835		0.15	2.00
118.32		118.7		-0.38		4.867		0.15	2.00
59.16		59.6		-0.44		5.898		0.15	2.00
0.00		0.4		-0.40		6.930		0.15	2.00
-59.16		-58.8		-0.36		7.961		0.15	2.00
-118.32		-117.9		-0.42		8.992		0.15	2.00
-177.48		-177.1		-0.38		10.024		0.15	2.00
-236.64		-236.3		-0.34		11.055		0.15	2.00
-295.80		-295.5		-0.30		12.087		0.15	2.00
-354.95		-354.6		-0.35		13.118		0.15	2.00
-414.11		-413.8		-0.31		14.149		0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3

F-G010 REV 03



Calibration Report

RESULT OF CALIBRATION (CONTINUE) :

2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (\pm pH)	COVERAGE FACTOR k
4.006	4.006	0.000	4.015	0.012	2.00
7.000	7.000	0.000	6.914	0.012	2.00
10.008	10.010	-0.002	9.996	0.014	2.00

3. DISPLAY UNIT WITH TEMPERATURE

STANDARD READING ($^{\circ}$ C)	UUC READING ($^{\circ}$ C)	CORRECTION ($^{\circ}$ C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (\pm $^{\circ}$ C)	COVERAGE FACTOR k
25.005	25.0	0.005	—	0.0085	2.00

4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



CERTIFICATE No.: 23M2442
REFERENCE No.: 68471-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BSA224S-CW
SERIAL No : 36591843
ID No : BA 09/61
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 10-Mar-23
APPROVED BY : PONGSAK J.
ISSUED DATE : 16-Mar-23
RECEIVED DATE : 10-Mar-23

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



CERTIFICATE No.: 23M2442

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
ID No : BA 09/61
AIR PRESSURE : 1010mbar \pm 1mbar
AMBIENT TEMPERATURE : 23°C \pm 1°C
MODEL : BSA224S-CW
S/N : 36591843
RECEIVED DATE : 10-Mar-23
CALIBRATION DATE : 10-Mar-23
RELATIVE HUMIDITY : 49 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

- 1) STANDARD WEIGHT SET E2
2) STANDARD WEIGHT E2
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

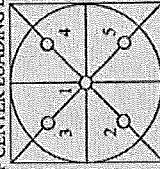
SERIAL No : QK-1151
MODEL : E2
15843
CERTIFICATE No : M2302013S
M2302014S
DUE DATE : 02-Feb-25
02-Feb-25

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 200 g WAS 0 g
4. DEPARTURE FROM NOMINAL VALUE/LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000058
0.1	0.1000	0.0000	0.000059
0.2	0.2000	0.0000	0.000059
0.5	0.5000	0.0000	0.000060
1.0	1.0000	0.0000	0.000060
2.0	2.0000	0.0000	0.000061
5.0	5.0000	0.0000	0.000063
10.0	10.0000	0.0000	0.000067
20.0	20.0001	-0.0001	0.000073
50.0	50.0000	0.0000	0.00011
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	0.00032

5. OFF CENTER LOADING ERROR

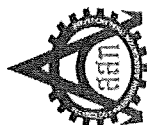


POINT	READING (g)
1	100.0000
2	99.9999
3	99.9998
4	100.0001
5	100.0000

OFF-CENTER LOADING

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



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

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

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

Cert.No.: 22TW248
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : Eco Sense
Model : DO 200A
Serial No. : JC 06721
ID No. : B12
Received Date : 31 October 2022
Test Date : 02 November 2022
Reference : 2210-0981WN-1
Submitted by : S.P.S. Consulting Service Co.,Ltd.
7 Phaholyothin 24, Phaholyothin Road.,
Jompol, Chatuchak, Bangkok 10900
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithean

Approved by :
Approved Signatory

(☒) Malee Butkrua
(☐) Sathip Meangmai
(☐) Warakorn Lemgagatrakul

Issue Date : 7 November 2022

B 0300603



Cert.No.: 22TW248
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	-	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	22MM150	20 Sep 2023

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 21D100513

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.12	8.12	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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a 1134238

CERTIFICATE No : 22T10972
REFERENCE No : 66837-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
MODEL : DRB 200
SERIAL No : 15110C0497
ID No : DRB 04/59
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 20-Dec-22

APPROVED BY :
PONGSAK J.
ISSUED DATE : 20-Dec-22
RECEIVED DATE : 20-Dec-22

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

F-G010 REV : 02

CERTIFICATE No : 22T10972

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : DRB 04/59
RECEIVED DATE : 20-Dec-22
AMBIENT TEMPERATURE : 23°C ± 1°C
MODEL : DRB 200
SERIAL NUMBER : 15110C0497
CALIBRATION DATE : 20-Dec-22
RELATIVE HUMIDITY : 52 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :
1) DATA LOGGER WITH TC TYPE K HYDRA 2635A 8099008 22T17511 10-Jul-23
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.
RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

BLOCK No.1 FRONT					
13	14	15	13	14	15
10	11	12	10	11	12
7	8	9	7	8	9
4	5	6	4	5	6
1	2	3	1	2	3

BLOCK No.2 FRONT					
13	14	15	13	14	15
10	11	12	10	11	12
7	8	9	7	8	9
4	5	6	4	5	6
1	2	3	1	2	3

TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.	1	2
Controller temperature (°C)	145	145
Indicating Temperature	145	145
Locations		
1	149.8	149.9
2	149.6	149.8
3	149.7	149.8
4	149.8	149.7
5	149.9	149.8
6	149.8	149.9
7	149.8	150.1
8	149.8	150.8
9	149.9	150.0
10	149.8	149.7
11	149.9	150.0
12	149.7	149.8
13	149.9	150.0
14	149.9	149.8
15	149.7	149.7
Uncertainty of Measurement (°C)	0.86	0.86

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

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

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

END OF CALIBRATION REPORT

F-G010 REV : 02

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER

Manufacturer : PERKINELMER

Model : LAMBDA 25

Serial No.: 501S14123010

ID No.: SP03/58

Calibration Mode :

WAVELENGTH ACCURACY

PHOTOMETRIC ACCURACY

Condition As Found :

GOOD

Customer :

S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,
CHOMPON, CHATUCHAK,
BANGKOK 10900, THAILAND.

Location :

ORGANIC LABORATORY IV

Ambient Temperature :

(25.0 ± 5) °C

Relative Humidity :

(48.4 ± 25) %

Received Date :

30 AUGUST 2023

Calibration Date :

30 AUGUST 2023

Date of Issue :

31 AUGUST 2023

Calibrated by :

Nathakorn Pisupaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Calibration Method :

This instrument was calibrated by using on-site calibration procedure in-house method : CP-SP-01
The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution. Photometric accuracy by using absorbance standard filter and absorbance standard solution
The calibration procedure used was based on ASTM E275-01, ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-IN2N5N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0090-22	08/04/2024

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

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

- 3.1 The UK National Physical Laboratory (NPL)
- 3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.3	0.05	0.16	2.00
	467.82	468.0	0.18	0.16	2.00
	536.56	536.6	0.04	0.16	2.00
RM-DL	640.50	640.4	-0.10	0.16	2.00
	740.09	740.0	-0.09	0.16	2.00
	864.94	865.0	0.06	0.16	2.00

UUC* = Unit Under Calibration

Continuation of Calibration Certificate

Cert. No. : SP23016
Job No. : VC66SP0014
Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0564	0.0047	0.0031	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0032	2.00
		29381	0.5	0.5416	0.5429	0.0013	0.0032	2.00
	546.1	29360	1.0	0.9821	0.9849	0.0028	0.0030	2.00
		29914	0.7	0.6961	0.6961	0.0000	0.0030	2.00
		29381	0.5	0.5073	0.5073	0.0000	0.0030	2.00
	590.0	29360	1.0	1.0222	1.0244	0.0022	0.0030	2.00
		29914	0.7	0.7237	0.7234	-0.0003	0.0030	2.00
		29381	0.5	0.5361	0.5360	-0.0001	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9775	0.0022	0.0030	2.00
		29914	0.7	0.6910	0.6910	0.0000	0.0030	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	20	20	0.2422	0.2462	0.0040	0.0101	2.00	
		40	0.4866	0.4900	0.0034	0.0115	2.00	
		60	0.7414	0.7390	-0.0024	0.0068	2.00	
	235.0	80	0.9858	0.9871	0.0013	0.0093	2.00	
		100	1.2442	1.2480	0.0038	0.0087	2.00	

UUC* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S141230

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.0001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 1100 nm-190 nm

Scanning Speed 7.5 nm/min

Data Pitch 0.1 nm

Band width(Wavelength) 1.0 nm

Band width(Vis) 1.0 nm

Band width(Uv) 1.0 nm

Stray Light** UUC* Reading at 220 nm	Transmission T(%)	Absorbance(A)
	0.0111	3.9564

**Specific Acceptance :

Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A

**Stray light not TISI Accredited

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

End of Calibration Certificate

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-252
N1013002	1.0A Neutral density filter	1	MG2-358
B3100652 Or N9307029	Electronic Flow Meter	1	NA
B0505495	Test Jig	1	NA
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190
N3050119	Cr Lumina HCL	1	091911-020150

Procedure Checklist

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

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.

3.1 Flame Technique

- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

3.2 THGA Technique

- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN

- ☒ Perform Cooling System maintenance if needed per SDB# COSV005.STN.
- ☒ Check auto sampler operation.
- ☒ Perform an auto sampler check valve test as described in the Service Manual.
- ☒ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ☒ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.
- 4. Electrical:**
- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.
- 5. Optics:**
- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect and clean the furnace windows, if needed.
- ☒ Inspect and clean the GFTV camera lens, if needed.
- ☒ Inspect optics. Clean or replace if necessary,
- 6. Gasses:**
- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-Installation Checklist SDB.
- ☒ Verify that the air filter element is dry. Replace if necessary.

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ : Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ : Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ : Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ : Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ : Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests [Flame]:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9798	0.9877	Passed
0.2 A ND Filter	± 5% from Cert.	0.2042	0.1985	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0016	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0044	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0001	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0013	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3421	Passed

9. After PM Performance tests [THGA]:

9.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

Parameter	Specification	Test Results	Pass/Fail
Internal Flow Rate	250 mL/min ± 25 mL/min	255	Passed
External Flow Rate	100 mL/min ± 10 mL/min	105	Passed

9.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	≤ 0.005 Abs.	0.0005	Passed
Standard Deviation	≤ 0.005	0.0004	Passed

9.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

Parameter	Specification	Results	Pass/Fail
Cr m ₀ Results	≤ 7.0 pg/0.0044 A-s	5.8	Passed
Precision	≤ 2.0 %	1.18	Passed

9.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

Parameter	Specification	Results	Pass/Fail
Cu m ₀ Result	≤ 16.5 pg/0.0044 A-s	13.6	Passed
Zeeman Ratio	0.52 ± 0.04	0.52	Passed


10. Review:

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

Additional Comments

Additional Comments Regarding the PM	
Zeeman Ratio	$= \frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area) + Background Signal (Peak area)}}$ $= \frac{0.1614}{0.1614+0.1448}$ $= 0.52$

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900T have been completed.	
This PinAAcle 900T <input checked="" type="checkbox"/> Passes <input type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative:	Dany Date: 06-Jun-2023 (DD-MM-YYYY)
Authorized Customer Representative:	 Date: 06-Jun-2023 (DD-MM-YYYY)



MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

Customer :	S.P.S.Consulting Service Co.,Ltd	Date Tested:	July 6, 2023
Address :	7 Soi Phaholyothin 24 Phaholyothin Road Jompol Chatuchak, Bangkok 1090	Recommendation Recertification Period	6 Months
User Name:	K.Phenpha Vipasthawatt	Recertification Due:	January 6, 2024
Phone:	083-9269252	Date Last Certified:	January 11, 2023
Fax:	02-513-4221	Visit Number:	1 of 2
		PerkinElmer Phone:	02-719-6420 ext 206
		PerkinElmer Fax:	02-318-5597

CONFIGURATION TESTED	ACCESSORIES/COMPONENT NOT INCLUDED
MODEL OPTIMA 5300DV	
TESTED EQUIPMENT IPV Methods	EXPIRATION
TEST STANDARD USED Multielement Standard Wavecal Solution VIS Wavecal solution Instrument Cal. STD4	EXPIRATION DATE October 30, 2023 September 30, 2023 August 30, 2023 November 30, 2023
CUSTOMER SUPPLIED 2 % HNO3 10 % HNO3	CUSTOMER INITIALS



MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

SERIAL NUMBER	077C7042401	DATE TESTED	July 6, 2023
1. MECHANICAL CHECKS			
A. Inspect and clean all fans and filters. <input type="checkbox"/> OK			
B. Inspect and replace as necessary, all torch components including the RF coil. <input type="checkbox"/> OK			
C. Inspect all tubing for sign of clacking or leaking. <input type="checkbox"/> OK			
D. Adjust water and gas pressure regulator settings. <input type="checkbox"/> OK			
E. Inspect and leak check pneumatics drawers. <input type="checkbox"/> OK			
F. Clean the exterior of the instrument. <input type="checkbox"/> OK			
2. OPTICAL CHECKS			
A. Inspect and clean all optical components. <input type="checkbox"/> OK			
B. As required, check and replace all purgefilters. <input type="checkbox"/> OK			
C. Recheck optical alignment. <input type="checkbox"/> OK			
3. COOLING SYSTEM CHECKS			
A. Perform preventive maintenance on chiller. <input type="checkbox"/> OK			
B. Flush out the chiller every year. <input type="checkbox"/> N/A			
4. PERFORMANCE CHECKS			
A. Torch View Alignment. <input type="checkbox"/> OK			
B. Wavelength Calibration. <input type="checkbox"/> OK			



MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

SERIAL NUMBER : 077C7042401		DATE TESTED : July 6, 2023	
PARAMETER	SPECIFICATION	FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm	≤ 0.007	
	Ni 231.604 nm	≤ 0.008	
	Ni 341.476 nm	≤ 0.012	
Spectral Resolution : VIS	La 408.672 nm	≤ 0.020	
	Ba 455.403 nm	≤ 0.025	
Precision	As 193.656 nm	% RSD	< 1.0
	Zn 213.856 nm	% RSD	< 1.0
	Mn 257.610 nm	% RSD	< 1.0
	La 379.478 nm	% RSD	< 1.0
	Ba 455.403 nm	% RSD	< 1.0
	Ba 493.408 nm	% RSD	< 1.0
Detection Limits : Axial	Tl 190.080 nm	3(sd)	2.37 ppb
	As 193.696 nm	3(sd)	6.78 ppb
	Pb 220.353 nm	3(sd)	0.82 ppb
Detection Limits : Radial	As 193.696 nm	3(sd)	23.56 ppb
	Zn 213.856 nm	3(sd)	2.85 ppb
	Mn 257.610 nm	3(sd)	3.66 ppb
	La 379.478 nm	3(sd)	5.10 ppb
	Ba 455.403 nm	3(sd)	0.12 ppb
	Ba 493.408 nm	3(sd)	1.17 ppb
BEC : Axial (IB X 500)/(S-IB)	Cd 226.502 nm	≤ 150 ppb	117.07
BEC : Radial (IB X 1000)/(S-IB)	Mn 257.610 nm	≤ 45 ppb	22.09



MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

SERIAL NUMBER	077C7042401	DATE TESTED	July 6, 2023
Remarks :	Commissioning follow as commissioning performance sheets.		

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

<input checked="" type="checkbox"/>	meets
<input type="checkbox"/>	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.

Service Department-PerkinElmer Ltd.

Authorized Representative: Wiphan Promlunda
(Mr. Wiphan Promlunda)
Service Engineer



CALIBRATION CERTIFICATE

Certificate No. : S2022090647-0003

Date Issued : 03-Oct-22

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
 7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
 Bangkok 10900

Equipment : Incubator

Manufacturer : BINDER

Model : BD 115

Serial No. : 12-16967

ID No./Tag No. : IN 05/56

Date Received : 30-Sep-22

Date Calibrated : 30-Sep-22

Calibrated by : Mr. Surat Aumarb

Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

Result of Calibration

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

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

Approved by: *Sarayuth T.*
 (Mr. Sarayuth Tochua)



Page 1 of 2

Certificate No. : S2022090647-0003

Environment : Ambient Temperature : Start record 26.5 °C, Stop record 26.6 °C

Relative Humidity : Start record 54.8 %RH, Stop record 54.6 %RH

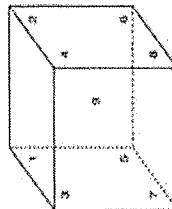
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability ¹ (°C)	Measured Uniformity ² (°C)	Overall Variation ³ (°C)
35	35.0	35.0	0.03	0.07	0.14
41.5	41.5	41.5	0.03	0.08	0.15

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	STD Uncertainty ⁴ ±°C
35	34.88	34.86	34.89	34.90	34.93	34.92	34.95	34.89	34.93	0.18
41.5	41.40	41.33	41.32	41.41	41.43	41.43	41.38	41.33	41.37	0.18

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2207-125-0001 for Digital Thermometer with Probe (Agilent) Module 1 (73) NTC, Pt1000 Serial No. MY44024042, Due 01-Feb-23

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate

Page 2 of 2



CERTIFICATE No : 23T2448
REFERENCE No : 68471-8


PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WNB29
SERIAL No : L614.0123
ID No : WB 05/58
CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 10-Mar-23

APPROVED BY :  PONGSAK J.
ISSUED DATE : 17-Mar-23
RECEIVED DATE : 10-Mar-23

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



CERTIFICATE No : 23T2448

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : WB 05/58
RECEIVED DATE : 10-Mar-23
AMBIENT TEMPERATURE : 26 °C ± 1 °C
MODEL : WNB29
SERIAL NUMBER : L614.0123
CALIBRATION DATE : 10-Mar-23
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : DATA LOGGER WITH RTD
MODEL : 2625A

SERIAL No : 6603614
CERTIFICATE No : 22T7514

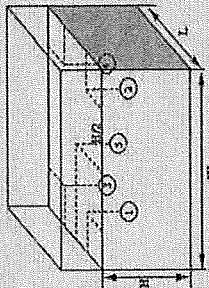
DUE DATE : 05-Jul-23

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.9
Overall Variation of Line Voltage (V) : 0
Instrument Condition : Normal



PROBE INSTALLATION
POSITION IN THE BATH

BATH PERFORMANCE

Controller Temperature (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.4	0.12	0.14	0.15	0.34
60.4	0.18	0.23	0.19	0.50

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations				Uncertainty (± °C)
		#1	#2	#3	#4	
50.4	50.4	49.45	49.42	49.36	49.32	0.19
60.4	60.4	60.17	60.20	60.06	59.97	0.25

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

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA. THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



Certificate of System Qualification

GC-CQ + GCMS-OQ

System ID: CN10630014
Organization Name: S.P.S.Consulting Service Co.,Ltd.
Organization Location: 7 Soi Paholyothin 24 Bangkok 10900
Date: September 1, 2023 2:41:39 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.50, GCMS.02.50
Overall Qualification Status: Pass

System Inspection and Basic Safety and Operation

Name: 6890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 6890
Front SSL

Setpoint Status:

Pressure: 25.0 psi

Pressure Change: -0.2 psi /5 minutes

Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 6890
Front SSL

Date: September 1, 2023 2:41:39 PM
System ID: CN10630014

Setpoint Status: Pass

Inlet Pressure: 25.0 psi
Actual: 24.8 psi

Accuracy: 0.2 psi

Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Accuracy

Name: 6890
Back SSL

Setpoint Status: Pass

Inlet Pressure: 25.0 psi
Actual: 24.9 psi

Accuracy: 0.1 psi

Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 6890
Front FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min

Measured Flow: 30.8 mL/min

Accuracy: 0.8 mL/min

Agilent Recommended: ≤ 10.0 % setpoint

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

Date: September 1, 2023 2:41:39 PM
System ID: CN10630014

Setpoint Status:

Pass

Flow Type:

Oxidizer

Setpoint:

400.0 mL/min

Measured Flow:

395.3 mL/min

Accuracy:

4.7

mL/min

Agilent Recommended:

<=

10.0

% setpoint

(40.0 mL/min)

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

Setpoint Status:

Pass

Flow Type:

Makeup

Setpoint:

25.0 mL/min

Measured Flow:

24.7 mL/min

Accuracy:

0.3

mL/min

Agilent Recommended:

<=

10.0

% setpoint

(2.5 mL/min)

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

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name

6890

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

230.0 229.5 °C

Accuracy:

-0.5

°C

Agilent Recommended:

>=

-1.0

% setpoint in K

(-5.0 °C)

<=

1.0

% setpoint in K

(5.0 °C)

Date:

September 1, 2023 2:41:38 PM

System ID:

CN10630014

Setpoint Status:

Pass

Zone:

Oven

Temperature:

100.0 99.8 °C

Accuracy:

-0.2

°C

Agilent Recommended:

>=

-1.0

% setpoint in K

(-3.7 °C)

<=

1.0

% setpoint in K

(3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name:

6890

Setpoint Status:

Pass

Setpoint/Average

Temperature:

100.0 99.83333 °C

Stability:

0.1

°C

Agilent Recommended:

<=

0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1

Front

SSL

/ Front

FID

Injection Tower

Name:

7683B

Setpoint Status:

Completed

Injection Volume on Column:

1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1

Front

SSL

/ Front

FID

Date:

September 1, 2023 2:41:38 PM

System ID:

CN10630014

Name: 6890

Setpoint Status: Pass

Base Signal: 15.8 pA

ASTM Noise counts 443.17
Drift counts/Hr 18437.04
Agilent Recommended: <= 788.00
Status: Pass

Overall Noise and Drift Test Status: Pass

Injection Precision

Tested Combination1 Front SSL / Front FID
Name: 7683B

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD: 0.67 %
Agilent Recommended: <= 3.00 %
Retention Time RSD: 0.02 %
<= 1.00 %

Overall Injection Precision Test Status: Pass

Signal to Noise

Tested Combination1 Front SSL / Front FID
Injection Tower
Name: 6890

Setpoint Status: Pass

Signal to Noise: 671482
Agilent Recommended: >= 300000

Date: September 1, 2023 2:41:39 PM
System ID: CN10630014

Overall Signal to Noise Test Status: Pass

Log Amp
Tested Combination2 Back SSL / External SQ
Name: 5975A
Setpoint Status: Pass

Overall Log Amp Test Status: Pass

RFPA

Tested Combination2 Back SSL / External SQ
Name: 5975A
Setpoint Status: Pass

Amu: 1050 m/z
Drift After Five Minutes: 12 mV and <= 100 mV
Agilent Recommended: >= -100 mV <= 1100 mV

Overall RFPA Test Status: Pass

Tune EI

Tested Combination2 Back SSL / External SQ
Name: 5975A

Setpoint Status: Pass
Filament: 1

Setpoint Status: Pass
Filament: 2

Overall Tune EI Test Status: Pass

Date: September 1, 2023 2:41:39 PM
System ID: CN10630014

Signal to Noise EI

Tested Combination2	Back	SSL	/	External	SQ
Name:	6975A				
Source:	EI - Inert	Filament	1		
Setpoint Status:	Pass				
Signal to Noise:	113				
Agilent Recommended:	>= 80				
Source:	EI - Inert	Filament	2		
Setpoint Status:	Pass				
Signal to Noise:	183				
Agilent Recommended:	>= 80				

Overall Signal to Noise EI Test Status

Pass

Instrument Details

Purpose
This section describes the as found system configuration.

Details	
System	System ID CN10630014 Manufacturer Agilent Technologies Name 6890
Tested Combination1	Injection Technique Injection Tower Inlet Front Detector Front LTM Included? No
Tested Combination2	Injection Technique Manual Injection Inlet Back Detector External LTM Included? No
Sampler 1	Manufacturer Agilent Technologies Type Injection Tower Name 7683B Model Number G2913A Serial Number CN64136101 Firmware Revision A.11.02 Usage Sample Injection Location Front Syringe Volume (µL) 10

Sampler 2

Agilent Technologies

Manual Injection

Sample Injection

Syringe Volume (µL)

10

Mainframe 1

Agilent Technologies

6890

Model Number

G1530N

Serial Number

CN630014

Firmware Revision

N.06.07

Oven Type

Standard

Inlet 1

Agilent Technologies

6890

Type

SSL

Location

Front

Carrier Gas

Helium

Control Type

Electronic Pressure Control (EPC)

Purged Inlet

Yes

Inlet 2

Agilent Technologies

6890

Type

SSL

Location

Back

Carrier Gas

Helium

Control Type

Electronic Pressure Control (EPC)

Purged Inlet

Yes

Date:

September 1, 2023 2:41:39 PM

System ID:

CN10630014

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Detector 1

Manufacturer

6890

Type

FID

Adapter

Packed

Control Type

Electronic Pressure Control (EPC)

Location

Front

Makeup Gas

Nitrogen

Detector 2

Manufacturer

Agilent Technologies

Name

Mass Spectrometer

Type

Mass Spectrometer

Location

External

Mass Spectrometer 1

Manufacturer

Agilent Technologies

Type

SQ

Name

5975A

Serial Number

US61633454

Firmware Revision

5.02.09

High Vacuum System

Turbo Pump

Scouting Run Standard

OFN Std

MS EI Source 1

Manufacturer

Agilent Technologies

Source Type

EI - Inert

Number of filaments

2

Date:

September 1, 2023 2:41:39 PM

System ID:

CN10630014

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Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer: Adirek Rattanawijit
Logged On User Name: adirek.rattanawijit@non.agilent.com
Signature Creation Date: September 1, 2023
Reason for Signature: Executed protocol and published this original version of document

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Date: September 1, 2023 2:41:39 PM
System ID: CN10630014

User Name: adirek.rattanawijit
Hostname: CR14-QA

System ID: CN10630014
Print Date: September 1, 2023 2:41:42 PM

SPS_OQGCMS_CN10630014_2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 1, 2023 1:29:18 PM	Audit	SessionCreated	Session	None
September 1, 2023 1:29:16 PM	Start	Configuration	Session	None
September 1, 2023 1:29:18 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
September 1, 2023 1:32:47 PM	Audit	EplLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks\Gc\Configurations\02.50\Gc.02.50.eqp], EQP File Name: [Gc.02.50.eqp], EQP Name: [AgilentRecommended] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks\GcMs\Configurations\02.50\GcMs.02.50.eqp], EQP File Name: [GcMs.02.50.eqp], EQP Name: Name: [AgilentRecommended]
September 1, 2023 1:32:50 PM	End	Configuration	Session	None
September 1, 2023 1:32:54 PM	Start	Qualification	Session	OQ
September 1, 2023 1:32:54 PM	Start	Execution	System Inspection and Basic Safety and Operation - 6890 - Qualitative Test - No setpoints associated	None
September 1, 2023 1:33:23 PM	End	Execution	System Inspection and Basic Safety and Operation - 6890 - Qualitative Test - No setpoints associated	Run Count : 1

Date: September 1, 2023 2:41:39 PM
System ID: CN10630014

User Name: adirek.rattanawijit
Hostname: C614-QA
SPS_OGCOMS_CN10630014_2023 Transaction log :
System id: CN10630014
Print Date: September 1, 2023 2:41:42 PM

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 1, 2023 1:33:28 PM	Start	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and -<= 0.5 psi	None Run Count : 1
September 1, 2023 1:33:34 PM	End	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and -<= 0.5 psi	None
September 1, 2023 1:33:37 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
September 1, 2023 1:33:41 PM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
September 1, 2023 1:33:43 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
September 1, 2023 1:33:50 PM	End	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
September 1, 2023 1:33:53 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
September 1, 2023 1:34:00 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
September 1, 2023 1:34:02 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
September 1, 2023 1:34:12 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None

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Date: September 1, 2023 2:41:39 PM
System ID: CN10630014

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User Name: adirek.rattanawijit
Hostname: C614-QA
SPS_OGCOMS_CN10630014_2023 Transaction log :
System id: CN10630014
Print Date: September 1, 2023 2:41:42 PM

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 1, 2023 1:34:14 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
September 1, 2023 1:34:21 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
September 1, 2023 1:34:23 PM	Start	Execution	GC Oven Temperature Accuracy - 6890 - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
September 1, 2023 1:34:50 PM	Audit	Data	GC Oven Temperature Accuracy - 6890 - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
September 1, 2023 1:34:52 PM	End	Execution	GC Oven Temperature Accuracy - 6890 - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
September 1, 2023 1:34:55 PM	Start	Execution	GC Oven Temperature Accuracy - 6890 - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
September 1, 2023 1:35:33 PM	Audit	Data	GC Oven Temperature Accuracy - 6890 - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
September 1, 2023 1:35:35 PM	End	Execution	GC Oven Temperature Accuracy - 6890 - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
September 1, 2023 1:35:37 PM	Start	Execution	GC Oven Temperature Stability - 6890 - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None

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Date: September 1, 2023 2:41:39 PM
System ID: CN10630014

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User Name: adirek.rattanawijit

Hostname: C614-QA

SPS_OQGCMS_CN10630014_2023 Transaction log :

System Id: CN10630014

Print Date: September 1, 2023 2:41:42 PM

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 1, 2023 1:36:42 Audit PM	Audit	Data	GC Oven Temperature Stability - 889C: - Temperature : Oven - S: 100.0°C - L <= 0.5°C	Manual Data Entry
September 1, 2023 1:36:44 End PM	End	Execution	GC Oven Temperature Stability - 899C: - Temperature : Oven - S: 100.0°C - L <= 0.5°C	Run Count: 1
September 1, 2023 1:36:47 Start PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
September 1, 2023 1:37:18 Audit PM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : C:\Users\Win 10 Home\Desktop\OQPV_GCIS PS\OQPV2023\OQPV2023S COUT_001.D\FID1A.CH Run Count: 1
September 1, 2023 1:37:41 End PM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
September 1, 2023 1:37:44 Start PM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
September 1, 2023 1:38:02 Audit PM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : C:\Users\Win 10 Home\Desktop\OQPV_GCIS PS\OQPV2023\OQPV2023N D_001.D\FID1A.CH Run Count: 1
September 1, 2023 1:38:08 End PM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None

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User Name: adirek.rattanawijit

Hostname: C614-QA

SPS_OQGCMS_CN10630014_2023 Transaction log :

System Id: CN10630014

Print Date: September 1, 2023 2:41:42 PM

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 1, 2023 1:38:23 Start PM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 80	None
September 1, 2023 1:38:23 Start PM	Start	Execution	Tune EI - 5975A SQ: - Source: - None EI - Inert Filament 2 (Qualitative - No setpoints associated)	None
September 1, 2023 1:38:58 End PM	End	Execution	Tune EI - 5975A SQ: - Source: - Run Count: 1 EI - Inert Filament 2 (Qualitative - No setpoints associated)	None
September 1, 2023 1:39:01 Start PM	Start	Execution	Tune EI - 5975A SQ: - Source: - None EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
September 1, 2023 1:39:16 End PM	End	Execution	Tune EI - 5975A SQ: - Source: - Run Count: 1 EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
September 1, 2023 1:39:18 Start PM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 80	None
September 1, 2023 1:39:27 Audit PM	Audit	Data	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 80	Data files Path: C:\Users\Win10 Home\Desktop\OQPV_GCIS PSOQPV2023\OQPV2023S N_F1_001.D\data.ms
September 1, 2023 1:40:37 End PM	End	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 80	Run Count: 1
September 1, 2023 1:40:41 Start PM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 80	None

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User Name: adirek.rattanawijit Hostname: C614-QA		System ID: CN10630014 Print Date: September 1, 2023 2:41:42 PM	
SPS_OQGCMS_CN10630014_2023 Transaction log :			
Time	Transaction State	Activity Performed	Optional Information
September 1, 2023 1:41:07 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Back SSL, SQ - Source: EI - Inert using Filament 2 - L; >= 80 Data files Path : C:\Users\Win 10 Home\Desktop\OQPV_GCIS PSOQPV2023\OQPV2023S N_F2_001.D\data.ms
September 1, 2023 1:43:13 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ - Source: EI - Inert using Filament 2 - L; >= 80 None
September 1, 2023 1:43:24 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ - Source: EI - Inert using Filament 2 - L; >= 80 None
September 1, 2023 1:43:36 PM	End	Execution	Signal to Noise EI - Liquid Injection, Back SSL, SQ - Source: EI - Inert using Filament 2 - L; >= 80 Run Count : 1
September 1, 2023 1:43:41 PM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00% None
September 1, 2023 1:57:52 PM	Audit	AcqRestarted	Session None
September 1, 2023 2:01:02 PM	Audit	SessionReloaded	Session None
September 1, 2023 2:01:05 PM	Start	Qualification	Session OQ
September 1, 2023 2:01:05 PM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00% None

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User Name: adirek.rattanawijit
 Hostname: C614-QA

System Id: CN10630014
 Print Date: September 1, 2023 2:41:42 PM

SPS_OQGCMS_CN10630014_2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 1, 2023 2:01:39 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : C:\Users\Win10 Home\Desktop\IQCPV_GCIS PSOQPV2023\IP_002.D\FID 1A.CH
September 1, 2023 2:01:39 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : C:\Users\Win10 Home\Desktop\IQCPV_GCIS PSOQPV2023\IP_003.D\FID 1A.CH
September 1, 2023 2:01:39 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : C:\Users\Win10 Home\Desktop\IQCPV_GCIS PSOQPV2023\IP_004.D\FID 1A.CH
September 1, 2023 2:01:39 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : C:\Users\Win10 Home\Desktop\IQCPV_GCIS PSOQPV2023\IP_005.D\FID 1A.CH
September 1, 2023 2:01:39 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : C:\Users\Win10 Home\Desktop\IQCPV_GCIS PSOQPV2023\IP_006.D\FID 1A.CH
September 1, 2023 2:01:39 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path : C:\Users\Win10 Home\Desktop\IQCPV_GCIS PSOQPV2023\IP_007.D\FID 1A.CH
September 1, 2023 2:01:51 PM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Run Count : 1

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User Name: adirek.rattana Witt
Host Name: C814-QA
System ID: CN10630014
Print Date: September 1, 2023 2:41:42 PM

SPS_OQGCMS_CN10630014_2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 1, 2023 2:01:54 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	None
September 1, 2023 2:02:04 PM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path: C:\Users\Witt 10 Home\Desktop\OQPV_GOSIS PS\OQPV2023\SN_001.D\FI D1A.CH
September 1, 2023 2:02:16 PM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Run Count: 1
September 1, 2023 2:03:19 PM	Start	Execution	Log Amp - 5975A SQ: - Source: EI - Inert	None
September 1, 2023 2:06:05 PM	End	Execution	Log Amp - 5975A SQ: - Source: EI - Inert	Run Count: 1
September 1, 2023 2:06:07 PM	Start	Execution	RFFA - 5975A SQ: - Source: EI - Inert	None
September 1, 2023 2:17:21 PM	End	Qualification	Session	OQ
September 1, 2023 2:17:21 PM	Start	Reporting	Session	None
September 1, 2023 2:24:55 PM	End	Reporting	Session	None
September 1, 2023 2:24:55 PM	Start	Qualification	Session	OQ
September 1, 2023 2:25:10 PM	Start	Execution	RFFA - 5975A SQ: - Source: EI - Inert	None
September 1, 2023 2:34:28 PM	End	Execution	RFFA - 5975A SQ: - Source: EI - Inert	Run Count: 1
September 1, 2023 2:38:18 PM	End	Qualification	Session	OQ

User Name: adirek.rattana Witt
Host Name: C814-QA
System ID: CN10630014
Print Date: September 1, 2023 2:41:42 PM

SPS_OQGCMS_CN10630014_2023 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 1, 2023 2:38:18 PM	Start	Reporting	Session	None
September 1, 2023 2:40:24 PM	Audit	Reporting	Session	Report Generated: Certificate