

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

ลำดับที่ 1	คุณภาพอากาศในบรรยากาศ
ลำดับที่ 2	คุณภาพอากาศจากแหล่งกำเนิด
ลำดับที่ 3	คุณภาพน้ำ
ลำดับที่ 4	ระดับเสียงโดยทั่วไป
ลำดับที่ 5	คุณภาพอากาศในสถานประกอบการ
ลำดับที่ 6	ระดับเสียงในสถานประกอบการ
ลำดับที่ 7	ปริมาณเสียงสะสมติดตัวบุคคล

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศในบรรยากาศ		
Total Suspended Particulate	High Volume Air Sampler No. B01, R02, R05, R07	Digital Balance
Sulfur Dioxide	SO ₂ Analyzer No. B08, R07, R09	SO ₂ Analyzer No. B08, R07, R09
Nitrogen Dioxide	NO/NO ₂ /NO _x Analyzer No. B10, R01, R06	NO/NO ₂ /NO _x Analyzer No. B10, R01, R06
VOCs	Mass Flow Meter	GC/MS
2. คุณภาพอากาศจากแหล่งกำเนิด		
Total Suspended Particulate	Console No. R04 Pitot Tube No. B38	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Sulfur Dioxide	Personal Pump No. R45 Rotameter No. H-R02	Digital Balance
Carbon Monoxide	Personal Pump No. R35 Rotameter No. H-R02	CO Analyzer No. B02
3. คุณภาพน้ำ		
pH	-	pH Meter
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Total Suspended Solids (TSS)	-	Digital Balance
Total Dissolved Solids (TDS)	-	Digital Balance
Grease & Oil	-	Digital Balance
4. ระดับเสียงโดยทั่วไป		
L _{eq} 24 hr และ L ₉₀	Acoustic Calibrator Sound Level Meter No. ACO-R30, R45	-
5. คุณภาพอากาศในสถานประกอบการ		
1,3-Butadiene	Drycal Flowmeter	Drycal Flowmeter
	GC-FID	GC-FID
6. ระดับเสียงในสถานประกอบการ		
L _{eq} 8 hr, L _{max} และ TWA	Acoustic Calibrator Sound Level Meter ACO No. R52	-
6. ระดับเสียงสะสมแบบติดตัวบุคคล		
Noise Dose	Acoustic Calibrator Sound Level Meter ACO No. R50	-

คุณภาพอากาศในบรรยากาศ



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Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

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 (ft ³ /min)	R ²
B01	B01	05/02/2025	y = 1.190x-4.759	0.999
B02	B02	05/02/2025	y = 1.167x-1.802	0.999
B03	B03	03/02/2025	y = 1.142x-3.352	0.997
B04	B04	06/02/2025	y = 1.160x-3.139	0.998
B05	B05	06/02/2025	y = 1.155x-5.601	0.996
B06	B06	06/02/2025	y = 1.150x-1.476	0.999
B07	B07	03/02/2025	y = 1.143x-3.035	0.998
B08	B08	03/02/2025	y = 1.161x-4.459	0.999
B09	B09	05/02/2025	y = 1.177x-3.970	0.996
B10	B10	03/02/2025	y = 1.144x-2.471	0.998
B11	B11	03/02/2025	y = 1.195x-5.384	0.996
B12	B12	04/02/2025	y = 1.168x-4.228	0.998
B13	B13	04/02/2025	y = 1.165x-3.801	0.999
B14	B14	04/02/2025	y = 1.148x-3.248	0.996
B15	B15	04/02/2025	y = 1.173x-4.773	0.997
B16	B16	04/02/2025	y = 1.156x-4.042	0.998
B17	B17	06/02/2025	y = 1.140x-2.730	0.999
B18	B18	06/02/2025	y = 1.171x-4.178	0.999
B19	B19	06/02/2025	y = 1.151x-3.979	0.999
B20	B20	04/02/2025	y = 1.129x-1.255	0.999
B21	B21	04/02/2025	y = 1.132x-3.156	0.999
B22	B22	04/02/2025	y = 1.147x-2.649	0.997
B23	B23	03/02/2025	y = 1.158x-3.223	0.999
B24	B24	05/02/2025	y = 1.144x-3.476	0.997
B25	B25	03/02/2025	Y = 1.071x+1.478	0.997
B26	B26	04/02/2025	y = 1.142x-4.263	0.999
B27	B27	04/02/2025	y = 1.175x-5.192	0.996
B28	B28	04/02/2025	y = 1.173x-5.127	0.999
B29	B29	04/02/2025	y = 1.145x-1.952	0.996
B30	B30	06/02/2025	y = 1.162x-3.062	0.999
B31	B31	03/02/2025	y = 1.182x-5.652	0.998
B32	B32	03/02/2025	y = 1.167x-3.993	0.999
B33	B33	05/02/2025	y = 1.168x-4.451	0.998
B34	B34	05/02/2025	y = 1.127x-3.203	0.999



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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 (ft ³ /min)	R ²
B35	B35	05/02/2025	$y = 1.163x - 3.579$	0.997
B36	B36	05/02/2025	$y = 1.130x - 2.116$	0.999
B37	B37	04/02/2025	$y = 1.146x - 2.265$	0.996
B38	B38	04/02/2025	$y = 1.156x - 6.034$	0.998
B39	B39	03/02/2025	$y = 1.151x - 3.366$	0.998
B40	B40	03/02/2025	$y = 1.174x - 4.582$	0.999
B41	B41	06/02/2025	$y = 1.123x - 1.633$	0.997
B42	B42	03/02/2025	$y = 1.149x - 3.382$	0.997
B43	B43	03/02/2025	$y = 1.137x - 2.074$	0.997
B44	B44	03/02/2025	$y = 1.155x - 1.460$	0.999
R01	R01	04/02/2025	$y = 1.121x - 3.007$	0.999
R02	R02	03/02/2025	$y = 1.159x - 5.099$	0.999
R03	R03	05/02/2025	$y = 1.138x - 2.774$	0.998
R04	R04	05/02/2025	$y = 1.118x - 2.575$	0.999
R05	R05	03/02/2025	$y = 1.136x - 1.720$	0.998
R06	R06	05/02/2025	$y = 1.154x - 2.706$	0.997
R07	R07	03/02/2025	$y = 1.037x + 1.361$	0.999
R08	R08	03/02/2025	$y = 1.146x - 3.762$	0.996
R09	R09	05/02/2025	$y = 1.121x - 2.360$	0.997
R10	R10	05/02/2025	$y = 1.180x - 4.626$	0.999
R11	R11	05/02/2025	$y = 1.147x - 3.861$	0.996
R12	R12	03/02/2025	$y = 1.128x - 4.676$	0.998
R13	R13	04/02/2025	$y = 1.135x - 4.055$	0.999
R14	R14	04/02/2025	$y = 1.153x - 3.122$	0.997
R15	R15	03/02/2025	$y = 1.161x - 5.223$	0.998
R16	R16	03/02/2025	$y = 1.187x - 6.674$	0.999
R17	R17	03/02/2025	$y = 1.120x - 1.730$	0.999
R18	R18	03/02/2025	$y = 1.146x - 2.347$	0.998
R19	R19	06/02/2025	$y = 1.161x - 5.195$	0.999
R20	R20	06/02/2025	$y = 1.134x - 3.449$	0.998



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	16 March 2025	BRAND :	API	MODEL :	100A
NO.	SO ₂ -B08			SERIAL NO.	1003
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700		
Last Cal. Date : 29 October 2024			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.2	0.050	400.0	1.011
API Model 100A SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.4	in-Hg	25-35		
SAMPLE FLOW	656	cc/min	650 ± 10%		
PMT	102.9	mV	-20-150 with Zero Air		
UV LAMP	3010.4	mV	1000-4900		
STR. LGT	61.5	PPB	<100		
DRK PMT	62.9	mV	-50 - 200		
DRK LMP	57.6	mV	-50 - 200		
HVPS	675	V	550-900 constant		
DCPS	2529	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.011	-	1.0 ± 0.3		
SO ₂ Offset	21.9	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		



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CALIBRATION REPORT

SO₂ FLUORESCENT ANALYZER

DATE : 16 March 2025

BRAND : TELEDYNE

MODEL : TML-60

NO. SO₂-R07

SERIAL NO. TRS1068

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700
Last Cal. Date	: 29 October 2024	Serial No.	: 421

Reference Standard Gas

Standard Gas	: Sulphur Dioxide (SO ₂)	Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029
		Cylinder Conc.	: 49.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 49

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO ₂ Span	400.0	399.8	-0.050	400.0	1.009

API Model TML-60 SO₂ Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.7	in-Hg	25-35
SAMPLE FLOW	659	cc/min	650 ± 10%
PMT	103.3	mV	-20-150 with Zero Air
UV LAMP	3029.7	mV	1000-4900
STR. LGT	61.7	PPB	<100
DRK PMT	63.1	mV	-50 - 200
DRK LMP	57.9	mV	-50 - 200
HVPS	673	V	550-900 constant
DCPS	2524	mV	2500 ± 200
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.1	°C	5-40
PMT TEMP	7.4	°C	7 ± 2.0
SO ₂ Span Conc	400	PPB	20-20,000
SO ₂ Slope	1.009	-	1.0 ± 0.3
SO ₂ Offset	22.1	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)



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CALIBRATION REPORT

SO₂ FLUORESCENT ANALYZER

DATE : 16 March 2025

BRAND : API

MODEL : 100E

NO. SO₂-R09

SERIAL NO. 76

Calibrator (Dilution System)

Brand : Teledyne

Model : 700

Last Cal. Date : 29 October 2024

Serial No. : 421

Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO₂)

Cylinder No. : A00814SK

Certified Date : 21 June 2021

Expired Date : 21 June 2029

Cylinder Conc. : 49.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 49

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO ₂ Span	400.0	399.7	-0.075	400.0	1.007

API Model 100E SO₂ Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.6	in-Hg	25-35
SAMPLE FLOW	654	cc/min	650 ± 10%
PMT	103.1	mV	-20-150 with Zero Air
UV LAMP	3018.2	mV	1000-4900
STR. LGT	61.9	PPB	<100
DRK PMT	63.3	mV	-50 - 200
DRK LMP	58.2	mV	-50 - 200
HVPS	674	V	550-900 constant
DCPS	2521	mV	2500 ± 200
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.0	°C	5-40
PMT TEMP	7.2	°C	7 ± 2.0
SO ₂ Span Conc	400	PPB	20-20,000
SO ₂ Slope	1.007	-	1.0 ± 0.3
SO ₂ Offset	22.0	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 16 March 2025

BRAND : API

MODEL : 200E

NO. NOX-B10

SERIAL NO. 4465

Calibrator (Dilution System)

Brand : Teledyne

Model : 700

Last Cal. Date : 29 October 2024

Serial No. : 421

Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00726SV

Certified Date : 05 January 2023

Expired Date : 05 January 2026

Cylinder Conc. : 48.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 49

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.006
NO _x Span	400	400.2	0.050	400.0	1.010

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	509	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	672	V	420 - 900 constant
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	28.9	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.006	-	1.0 ± 0.3
NO _x Slope	1.010	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO _x Offset	0.8	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 16 March 2025

BRAND : API

MODEL : 200E

NO. NOX-R01

SERIAL NO. 769

Calibrator (Dilution System)

Brand : Teledyne

Model : 700

Last Cal. Date : 29 October 2024

Serial No. : 421

Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00726SV

Certified Date : 05 January 2023

Expired Date : 05 January 2026

Cylinder Conc. : 48.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 49

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.003
NO _x Span	400	399.9	-0.025	400.0	1.007

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.4	mV	-20 - 150
AZERO	94.2	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.4	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	315.2	°C	315 ± 5
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.003	-	1.0 ± 0.3
NO _x Slope	1.007	-	1.0 ± 0.3
NO Offset	1.0	mV	-20 to +150
NO _x Offset	0.6	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



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

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	16 March 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R06	SERIAL NO.	4466		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700
Last Cal. Date	: 29 October 2024			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.008
NO _x Span	400	400.1	0.025	400.0	1.011
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	511	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	315.4	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO _x Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.5	mV	-20 to +150		
NO _x Offset	0.9	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Job Number :	J092400007	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	KhunWirasakKhumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Pluak Kate Station	E-mail address/Fax. :	wirasak.k@irpc.co.th
Working Date :	21 February 2025	Working Hour :	4 Hours

Service Report

Working Scope:

Service Station

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค ผล Calibration พบว่าอยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Dilutor และ Zero Air พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

Correction working:

Calibrate single-point of all analyzers.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	Clean sampling set.
Clean หัวคัดฝุ่น	

Part Replacements:

- Sample Filter 47 mm. 6 ea. (Part support by IRPC)

Addition Recommended:

- End -



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7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

NO-NO₂-NO_x Analyzer

Equipment :	NO-NO ₂ -NO _x analyzer.	Model :	42i
Serial Number :	1170530044	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading	0.7	0.8	ppb	
NO _x reading	4.0	8.5	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. ppb	11.4	11.3	ppb	0 to 60
NO _x BKG. ppb	11.2	11.1	ppb	0 to 60
NO COEF.	0.935	0.927	-	1.0 ± 0.3
NO _x COEF.	1.000	1.000	-	1.0 ± 0.3
NO ₂ COEF.	1.000	1.000	-	1.0 ± 0.3
Instrument Controls				
Ozonator	On	On		On/Off
PMT Supply	On	On		On/Off
Auto/Manual Mode	NO/NO _x	NO/NO _x		NO/NO _x , NO, NO _x
Baud Rate	9600	9600	bps	1200 to 9600
Temp Compensation	On	On	-	On/Off
Pressure Compensation	On	On	-	On/Off
Screen Contrast	45	45	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
Diagnostics				
Voltages				
PMT Supply	-917.6	-917.6	Vdc	-400 to -1200 Vdc
5 Supply	4.9	4.9	Vdc	5.0 ± 1 Vdc
15 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
-15 Supply	-15.0	-15.0	Vdc	-15.0 ± 1 Vdc
Temperatures				
Internal	36.7	35.4	°C	15 °C to 45 °C
Chamber	49.9	49.8	°C	50°C ± 2 °C
Cooler	-2.9	-3.0	°C	(-)3 °C ± 2 °C
Converter	324.5	325.8	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
Pressure	237.6	237.9	mmHg	250 ± 100 mmHg
Flow	0.675	0.679	L/min	0.5 to 1.00 L/min

Note :



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โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

SO₂ Analyzer

Equipment : Sulfur Dioxide analyzer.

Model : 43I-BZSAB

Serial Number : CM06280010

Manufacturer : Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	1.1	1.2	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
SO ₂ BKG. ppb	22.7	22.6	ppb	0 to 60
SO ₂ COEF	0.971	0.969	-	1.0 ± 0.3
Instrument Controls				
Temp Correction	On	On	On/Off	On
Pressure Correction	On	On	On/Off	On
Flash Lamp	On	On	On/Off	On
Communication setting				
Baud Rate	9600	9600	bps	9600 to 115000
Instrument ID	43	43	-	0 to 99
Screen Brightness	50	50	%	0 to 100
Service Mode	Off	Off	On/Off	Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 +/- 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	15.1	15.1	Vdc	15.0 +/- 1 Vdc
24.0 Supply	23.9	23.9	Vdc	24.0 +/- 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply	-602.0	-602.0		
Flash Supply	825	824		
3.3 Supply	3.3	3.3	Vdc	3.3 +/- 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	14.7	14.7	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.9	23.9	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	35.5	34.8	°C	15°C to 45°C
Chamber	45.3	45.0	°C	45°C ± 2°C
Pressure	732.5	733.4	mmHg	750 ± 100 mmHg
Flow	0.624	0.624	L/min	0.5 to 1.00 L/min
Lamp intensity	92	92	%	40 – 100 %

Note :

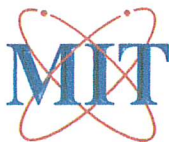


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Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160

Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Page 1 of 4

Certificate No. : L202412119-0001

Date Issued : 13-Dec-24

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

Equipment : Mass Flow meter

Manufacturer : Dwyer

Model : GMF-2101

Serial No. : -

ID No./Tag No. : MF01/51

Date Received : 11-Dec-24

Date Calibrated : 12-Dec-24

Calibrated by : Saruth Srichutikul

Calibration Method or Calibration Procedure Used

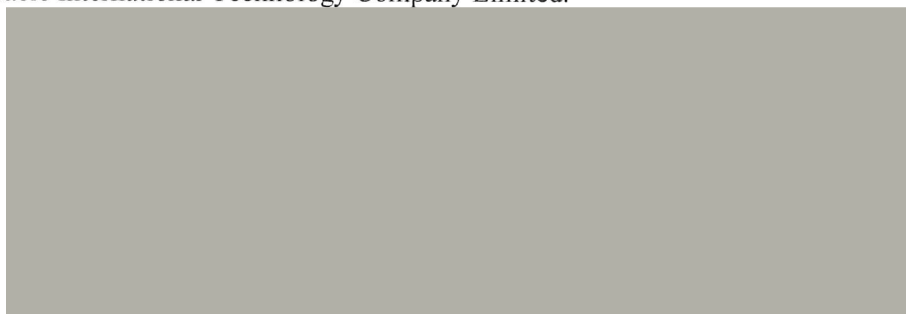
In-house method : CP-34 by comparison against mass flow calibrator.

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.



Certificate No. : L202412119-0001

Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$ Relative Humidity : $(50 \pm 15)\%\text{RH}$

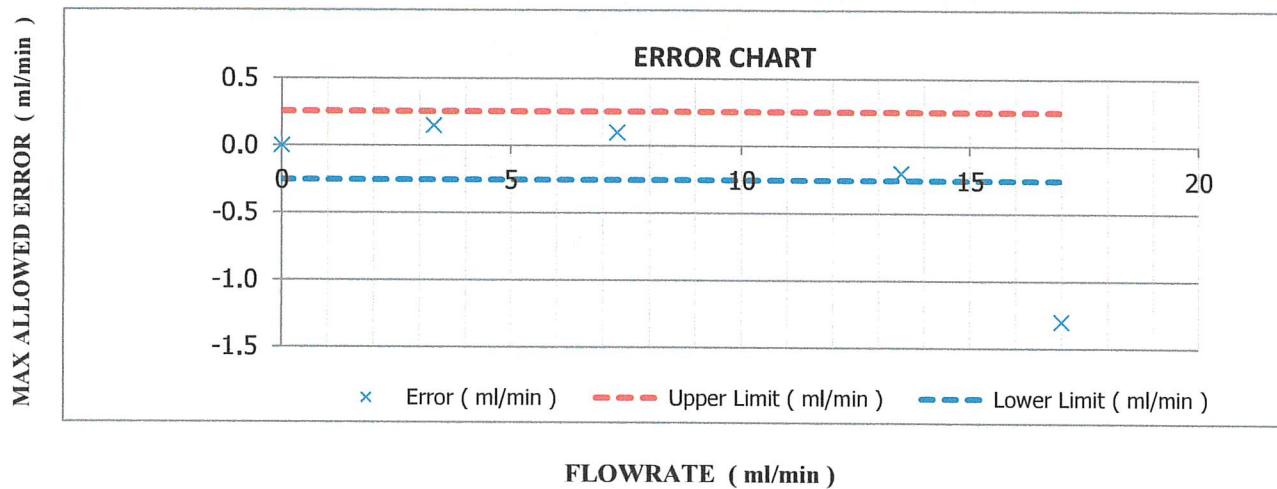
Capacity Range : 17 ml/min

Calibration Media : Air

Type : Mass Flowmeter

Unit Under Calibration Reference Condition : Pressure 101.325 kPa(abs) , 21 $^{\circ}\text{C}$, Nitrogen**Before Adjustment**

Temperature ($^{\circ}\text{C}$)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (\pm ml/min)
24.00	100.46	0.00	0.000 *	0.000	0.063
24.10	100.62	3.30	3.149	0.151	0.13
24.10	100.78	7.30	7.2	0.10	0.14
24.20	101.07	13.50	13.7	-0.20	0.15
24.20	101.30	17.00	18.3	-1.30	0.19

Error = Unit Under Calibration - Standard

Certificate No. : L202412119-0001

Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

Capacity Range : 17 ml/min

Calibration Media : Air

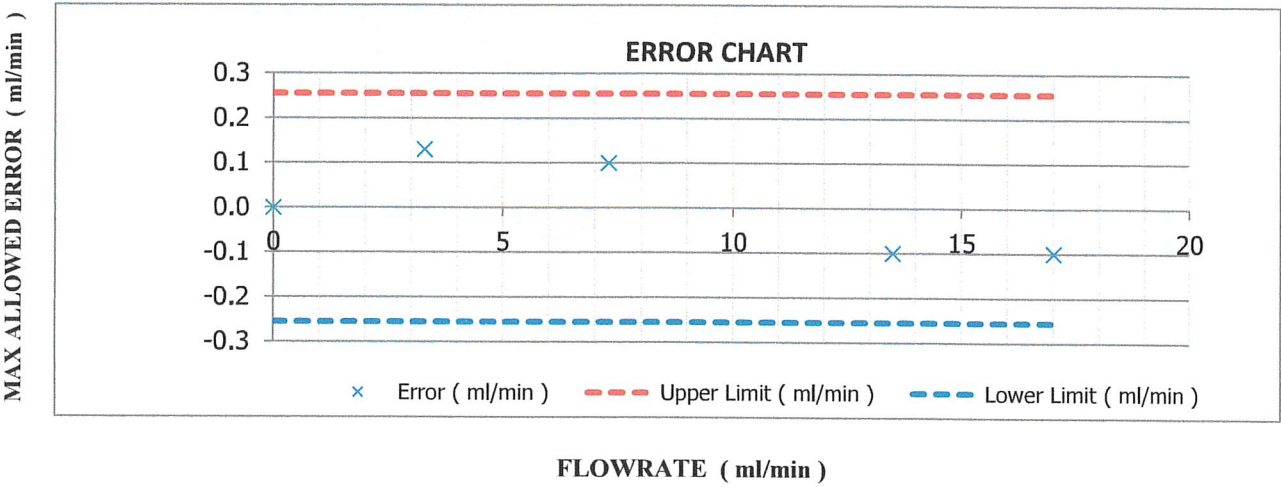
Type : Mass Flowmeter

Unit Under Calibration Reference Condition : Pressure 101.325 kPa(abs) , 21 °C , Nitrogen

After Adjustment

Temperature (° C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)
24.00	100.45	0.00	0.000 *	0.000	0.063
24.10	100.62	3.30	3.170	0.130	0.13
24.10	100.78	7.30	7.2	0.10	0.14
24.20	101.01	13.50	13.6	-0.10	0.15
24.00	101.19	17.00	17.1	-0.10	0.18

Error = Unit Under Calibration - Standard



Certificate No. : L202412119-0001

Note : The actual flow rate is determined by the equation :

$$Q_{Meas} = Q_{Ref} \times \frac{P_{Ref}}{P_{Meas}} \times \frac{T_{Meas}}{T_{Ref}}$$

; Q = Flow rate

; P = Absolute pressure

; T = Absolute temperature

; Subscript "Meas" = Measurement condition

; Subscript "Ref" = Reference condition

Condition As-Received : Used Item

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

Traceability of Certificate :

The International System of Units (SI) through

NIMT Certificate No. MW-0047-24, MW-0048-24 for Gas Flow meter Serial No. M5209179B/M5209179A, Due 03-Jul-25

End of Certificate



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

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 : 07-Mar-25

APPROVED BY : 

ISSUED DATE : 15-Mar-25

RECEIVED DATE : 07-Mar-25

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





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 07-Mar-25
AIR PRESSURE : 1009mbar \pm 1mbar CALIBRATION DATE : 07-Mar-25
AMBIENT TEMPERATURE : 24° C \pm 1° C RELATIVE HUMIDITY : 54 %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 :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) STANDARD WEIGHT SET	E2	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

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 THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.00000	0.00000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	0.00022

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
OFF-CENTER LOADING	0.0000


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 MULTIPLYING COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



GC Clarus 600/680 Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd		
Address (Instrument Location):	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
Serial Number:	680S14042502	Service Tag:	N68APSSFEMP
Customer Name (if applicable):	Ms.Naruecha	PM number:	1 of 2
Service Engineer Name:	Monchai Kitcharoenkeat	Service Order Number:	WO-
Date PM Performed: (DD-MMM-YYYY)	22-Feb-2025	Next PM Due Date: (DD-MMM-YYYY)	22-Aug-2025

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

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

General Instructions:

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

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Component List

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

Parts Lists

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)
N/A				
Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A				

Procedure Checklist

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

1. General:

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

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

L-N 220 Volt

L-G 220 Volt

N-G 0.33 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

Detector Channel A	<u>1.12</u>	mV.
Detector Channel B	<u>NA</u>	mV.

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

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

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

4. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

<p><i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i></p>		
<p><i>This Clarus600/680 GC Pass the preventive maintenance.</i></p>		
<p>Review of Preventive Maintenance:</p>		
<p>Authorized PerkinElmer Representative:</p> <p>Monchai Kitcharoenkeat</p>	<p><i>Monchai</i></p>	<p>Date:</p> <p>22-Feb-2025 (DD-MMM-YYYY)</p>
<p>Authorized Customer Representative:</p> <p>Ms.Naruecha</p>	<p><i>Naruecha</i></p>	<p>Date:</p> <p>22-Feb-2025 (DD-MMM-YYYY)</p>

คุณภาพอากาศจากแหล่งกำเนิด



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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com.. www.spscon.com

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	DH _g (mmH ₂ O)
B01	1563	03/03/2025	1.003	49.40
B02	8002514	03/03/2025	1.004	49.57
B03	1503016	04/03/2025	0.999	49.93
B04	00006659	04/03/2025	0.996	49.88
B05	00007428	04/03/2025	1.007	49.14
R01	1561	05/03/2025	0.996	49.32
R02	8002513	04/03/2025	1.003	49.96
R03	1570	04/03/2025	0.998	50.08
R04	8002519	03/03/2025	0.997	49.53
R05	1503015	05/03/2025	1.005	50.25

Remark : Accept Value of y (test) is $0.97 < y < 1.03$

Accept Value of DH_g (test) is 46.7 ± 6.1 (mmH₂O)



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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Calibration Data					
Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	03/02/2025	0.84	0.83
B37	S	0.99	03/02/2025	0.85	0.84
B38	S	0.99	04/02/2025	0.84	0.85
B39	S	0.99	05/02/2025	0.84	0.83
B40	S	0.99	03/02/2025	0.84	0.84
B41	S	0.99	03/02/2025	0.84	0.84
B44	S	0.99	03/02/2025	0.85	0.84
B45	S	0.99	04/02/2025	0.84	0.83
B46	S	0.99	03/02/2025	0.84	0.84
B47	S	0.99	06/02/2025	0.84	0.85
B48	S	0.99	03/02/2025	0.84	0.84
B49	S	0.99	06/02/2025	0.85	0.84
B54	S	0.99	03/02/2025	0.84	0.84
B56	S	0.99	05/02/2025	0.84	0.84
B57	S	0.99	05/02/2025	0.85	0.84
B58	S	0.99	05/02/2025	0.84	0.85

Remark : Accept value of Cp (test) is 0.84 + 0.01



CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : HI-LIGHT
MODEL / TYPE : N/A
SERIAL NO. : N/A[64-220066-2]
CLID. NO. : 212201113
JOB CONTROL NO. : 240730078440
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24 ROAD., JOMPOL,
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 30 July 2024

DATE OF ISSUED : 02 August 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sittipong Pimdee
Calibration Engineer

Approved By :



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24078440

F3-011-05/12-23

page 1 of 3



@clccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220066-2]
DATE OF CALIBRATION	:	31 July 2024
DUE DATE OF CALIBRATION	:	31 July 2025

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPPP-05** according to **DKD-R 6-1** as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 741B S/N. 8295020 with Pressure Module Model 700PD5 S/N. 89404505.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MP-0040-24, Due Date 08 February 2025.

UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2$. It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q24078440

F3-011-05/12-23

page 2 of 3



@clccalibration

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (inHg)	STD Reading (kPa)		Conversion to inHg		Correction (inHg)	
	Up	Down	Up	Down	Up	Down
0	0.000	0.000	0.0	0.0	0.0	0.0
-5	-16.591	-16.930	-4.9	-5.0	+0.1	0.0
-10	-33.521	-33.521	-9.9	-9.9	+0.1	+0.1
-15	-50.113	-50.113	-14.8	-14.8	+0.2	+0.2
-20	-66.704	-67.043	-19.7	-19.8	+0.3	+0.2
-25	-83.634	-83.973	-24.7	-24.8	+0.3	+0.2
-30	-100.564	-100.564	-29.7	-29.7	+0.3	+0.3

Uncertainty of measurement ± 0.2 inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 43 of 67

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24078440

F3-011-05/12-23

page 3 of 3





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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature . 25 ± 3 °C
Pressure . 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	06/01/2025	1,000	1,500	2,000	996	1,508	2,002	1.011x – 20.041	0.999
R02	SKC	224-PCXR4	626450	03/01/2025	1,000	2,000	3,000	1,001	1,502	1,999	1.008x – 15.192	0.999
R03	SKC	224-PCXR4	691592	06/01/2025	1,000	1,500	2,000	1,002	1,501	2,003	1.002x – 1.783	1.000
R04	SKC	224-PCXR4	691672	06/01/2025	1,000	1,500	2,000	999	1,499	2,007	1.007x – 10.290	1.000
R05	SKC	224-PCXR4	798470	06/01/2025	1,000	1,500	2,000	1,003	1,502	2,004	1.006x – 13.257	0.999
R06	SKC	224-PCXR4	798456	03/01/2025	1,000	1,500	2,000	1,004	1,509	2,008	1.007x – 7.980	1.000
R07	SKC	224-PCXR4	798480	07/01/2025	1,000	1,500	2,000	998	1,511	2,016	1.018x – 26.801	0.999
R08	SKC	224-PCXR4	883215	07/01/2025	1,000	1,500	2,000	994	1,510	2,011	1.016x – 24.787	0.999
R09	SKC	224-PCXR4	034650	03/01/2025	1,000	1,500	2,000	1,002	1,498	2,003	1.004x – 5.905	1.000
R10	SKC	224-PCXR4	091765	03/01/2025	1,000	1,500	2,000	1,005	1,504	2,007	1.013x – 21.216	1.000
R11	SKC	224-PCXR4	091763	03/01/2025	1,000	1,500	2,000	1,003	1,503	2,009	1.017x – 27.421	0.999
R12	SKC	224-PCXR4	091568	03/01/2025	1,000	1,500	2,000	1,001	1,497	2,011	1.008x – 9.043	1.000
R13	SKC	224-PCXR4	091638	07/01/2025	1,000	1,500	2,000	1,002	1,506	2,006	1.010x – 17.347	0.999
R14	SKC	224-PCXR4	091764	07/01/2025	1,000	1,500	2,000	995	1,509	2,009	1.016x – 27.121	0.999
R15	SKC	224-PCXR8	529457	03/01/2025	1,000	1,500	2,000	1,000	1,506	1,998	0.998x + 6.229	1.000
R16	SKC	224-PCXR8	529643	03/01/2025	1,000	1,500	2,000	993	1,504	2,003	1.011x – 20.809	1.000
R17	SKC	224-PCXR8	529645	03/01/2025	1,000	1,500	2,000	1,003	1,503	2,008	1.009x – 12.157	1.000
R18	SKC	224-PCXR8	566756	03/01/2025	1,000	1,500	2,000	996	1,495	2,001	0.998x – 1.251	1.000
R19	SKC	224-PCXR8	566802	03/01/2025	1,000	1,500	2,000	999	1,498	1,999	1.003x – 10.418	1.000
R20	SKC	224-PCXR8	529089	07/01/2025	1,000	1,500	2,000	994	1,502	1,996	1.000x – 2.818	1.000
R21	SKC	224-PCXR8	665728	07/01/2025	1,000	1,500	2,000	999	1,507	2,004	1.008x + 14.204	1.000
R22	SKC	224-PCXR8	707444	07/01/2025	1,000	1,500	2,000	997	1,496	1,997	1.008x – 17.894	1.000
R23	SKC	224-PCXR8	761067	03/01/2025	1,000	1,500	2,000	1,005	1,503	2,011	1.007x – 10.071	0.999
R24	SKC	224-PCXR8	707893	06/01/2025	1,000	1,500	2,000	995	1,506	2,008	1.014x – 21.584	1.000
R25	SKC	224-PCXR8	761052	06/01/2025	1,000	1,500	2,000	999	1,494	2,012	1.010x – 15.128	1.000
R26	SKC	224-PCXR8	707956	06/01/2025	1,000	1,500	2,000	998	1,503	1,998	1.000x – 1.995	1.000
R27	SKC	224-PCXR8	707398	06/01/2025	1,000	1,500	2,000	997	1,506	1,999	1.008x – 16.975	0.999
R28	SKC	224-PCXR8	707481	03/01/2025	1,000	1,500	2,000	1,000	1,508	2,006	1.004x – 8.483	0.999
R29	SKC	224-PCXR8	707402	03/01/2025	1,000	1,500	2,000	999	1,506	2,005	1.009x – 15.919	1.000
R30	SKC	224-PCXR8	093811	03/01/2025	1,000	1,500	2,000	997	1,511	2,001	1.004x – 7.380	1.000
R31	SKC	224-PCXR8	093183	03/01/2025	1,000	1,500	2,000	998	1,506	1,998	1.001x – 4.701	1.000
R32	SKC	224-PCXR8	671950	07/01/2025	1,000	1,500	2,000	1,004	1,499	2,009	1.005x – 8.811	1.000
R33	SKC	224-PCXR4	626254	07/01/2025	1,000	1,500	2,000	1,003	1,504	2,010	1.008x – 11.562	1.000
R34	SKC	224-PCXR4	626131	07/01/2025	1,000	1,500	2,000	997	1,508	2,003	1.006x – 10.490	1.000
R35	SKC	224-PCXR8	707460	06/01/2025	1,000	1,500	2,000	996	1,504	1,997	1.004x – 13.077	0.999
R36	SKC	224-PCXR8	707446	06/01/2025	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
R37	SKC	224-PCXR8	707432	03/01/2025	1,000	1,500	2,000	995	1,496	2,001	1.007x – 12.737	1.000
R38	SKC	224-PCXR8	707349	03/01/2025	1,000	1,500	2,000	994	1,495	1,998	1.002x – 5.061	1.000
R39	SKC	224-PCXR8	761095	03/01/2025	1,000	1,500	2,000	998	1,504	2,010	1.013x – 18.994	1.000



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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature . 25 ± 3 °C
Pressure . 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	06/01/2025	1,000	1,500	2,000	1,003	1,498	1,994	1.002x – 7.656	0.999
R41	SKC	224-PCXR4	626140	03/01/2025	1,000	1,500	2,000	998	1,493	2,010	1.010x - 14.928	1.000
R42	SKC	224-PCXR4	626463	07/01/2025	1,000	1,500	2,000	1,006	1,497	1,997	0.995x + 6.724	1.000
R43	SKC	224-PCXR4	626129	03/01/2025	1,000	1,500	2,000	997	1,506	1,998	1.009x – 17.135	0.999
R44	SKC	224-PCXR4	602753	06/01/2025	1,000	1,500	2,000	1,005	1,505	2,007	1.008x - 10.474	1.000
R45	SKC	224-PCXR4	626137	07/01/2025	1,000	1,500	2,000	998	1,503	1,999	1.000x – 1.915	1.000



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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-R01	Dwyer	VFB-65	07/01/2025	500	1,000	2,000	502.9	997.5	1992.8	1.000x - 0.381	0.999
H-R02	Dwyer	VFB-65	06/01/2025	500	1,000	2,000	500.6	1001.4	1998.5	1.001x - 0.360	1.000
H-R03	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	502.8	998.3	2002.4	0.998x + 2.822	1.000
H-R04	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	498.4	998.1	2007.2	0.997x + 3.508	1.000
H-R05	Dwyer	VFB-65	07/01/2025	500	1,000	2,000	500.8	995.2	1996.6	1.001x - 2.464	1.000
H-R06	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	502.0	997.4	1995.1	1.002x - 2.873	0.999



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

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 : 07-Mar-25

APPROVED BY : 

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 07-Mar-25
AIR PRESSURE : 1009mbar \pm 1mbar CALIBRATION DATE : 07-Mar-25
AMBIENT TEMPERATURE : 24° C \pm 1° C RELATIVE HUMIDITY : 54 %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 :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) STANDARD WEIGHT SET	E2	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

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 THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.00000	0.00000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	0.00022

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
OFF-CENTER LOADING	0.0000

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 MULTIPLYING COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



Cert. No. : SP24020

Pages 1 of 3

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,
CHOMPHON, CHATUCHAK,
BANGKOK 10900, THAILAND.

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 \pm 5) °C

Relative Humidity : (47.2 \pm 25) %

Received Date : 27 AUGUST 2024

Calibration Date : 27 AUGUST 2024

Date of Issue : 27 AUGUST 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :



SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

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-1N2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

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	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

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	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	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	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S14123010

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)
0.0117	3.8659

**Specific Acceptance :

Transmission \leq 1.0 T(%), Absorbance \geq 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



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 March 2025	Brand :	API	Model :	300E
No.	CO-B02			Serial No.	965
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 28 October 2024			Serial No. : 201-S		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.5 °C		% RH : 50	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	40.03	0.075	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4015.1	mV	2500-4800 mV		
CO Reference	3947.4	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	810	CC/Min	800 ± 10%		
Sample Temperature	48.5	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.5	°C	68 ± 2		
Box Temperature	30.7	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3036.1	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		



CERTIFICATE No : 24E6416
REFERENCE No : 73694-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : HANNA
MODEL : HI 3512
SERIAL No : TH118035
ID No : pH 04/56
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 27-Jun-24

APPROVED BY : 

ISSUED DATE : 27-Jun-24

RECEIVED DATE : 24-Jun-24



QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 24E6416

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : HANNA
ID No : pH 04/56
RECEIVED DATE : 24-Jun-24
AMBIENT TEMPERATURE : 23 ° C ± 3 ° C
MODEL : HI 3512
SERIAL NUMBER : TH118035
CALIBRATION DATE : 27-Jun-24
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 READING THE VALUE COMPARED WITH THE CALCULATED VALUE. THE DISPLAY AND ELECTROD WAS CALIBRATED BY USING STANDARD pH BUFFER
2. REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) pH STANDARD SOLUTION	00651-06	CC784945	4880-14413915	24-Aug-25
2) pH STANDARD SOLUTION	00651-08	CC785578	4881-14430633	31-Aug-25
3) pH STANDARD SOLUTION	00651-10	CC787086	4882-14483317	21-Sep-25
4) PROCESS CALIBRATOR	CA150	91S6079	24E1251	09-Apr-25
5) BATH	260014	1247 48074	23T9014	13-Sep-24
6) THERMOMETER WITH PROBE	421504	55000379	23T9623	13-Sep-24

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, USA.
 - NATIONAL INSTUTITE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

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

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.8	-0.69	-0.115	0.15	2.00
354.95	355.5	-0.55	0.884	0.15	2.00
295.80	296.4	-0.60	1.885	0.15	2.00
236.64	237.1	-0.46	2.886	0.15	2.00
177.48	178.0	-0.52	3.887	0.15	2.00
118.32	118.8	-0.48	4.887	0.15	2.00
59.16	59.6	-0.44	5.887	0.15	2.00
0.00	0.4	-0.40	6.888	0.15	2.00
-59.16	-58.7	-0.46	8.101	0.15	2.00
-118.32	-117.9	-0.42	9.345	0.15	2.00
-177.48	-177.4	-0.08	10.589	0.15	2.00
-236.64	-236.4	-0.24	11.834	0.15	2.00
-295.80	-294.5	-1.30	13.077	0.15	2.00
-354.95	-354.7	-0.25	14.322	0.15	2.00
-414.11	-413.9	-0.21	15.565	0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3



QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 24E6416

PAGE : 3 OF 3

Calibration Report

RESULT OF CALIBRATION (CONTINUE):

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

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (\pm pH)	COVERAGE FACTOR k
4.015	4.011	0.004	3.905	0.012	2.00
7.003	7.003	0.000	6.972	0.012	2.00
10.009	10.014	-0.005	9.570	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
25.004	25.0	0.004	---	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

CERT.No.: HS-V015C

Calibration Date : 20 Mar 24
 Submitted by : ASIA LAB @ CONSULTANT CO.,LTD
 184 Soi Phutthamonthon Sai 2 Soi 12,
 Bangphai, Bangkae, Bangkok 10160

Avg Room Temp : 20 °C
 Avg Water Temp : 20 °C
 Air Pressure : 760.00 mmHg
 Salinity : 0 ppt

Model : YSI 5000
 S/N : 15B100751
 Probe : YSI 5010
 S/N : 22D100097
 ID NO. : -
 Air Temp ref : S/N. F8065C26
 Barometric ref : S/N. F8065C26
 Water Temp ref : S/N. 11430
 Technician : Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.08	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.08	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.08	(PASS)	-
Measurement 10 (mg/l)	9.08	(PASS)	-
Mean Measurement	9.08	mg/l	-
Inaccuracy	0.01	mg/l	-
Overall Status	(PASS)		

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.

CERT.No.: HS-W015C

Calibration Date : 18 Mar 25
 Submitted by : S.P.S CONSULTING SERVICE CO.,LTD
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,
 Chatuchak, Bangkok, Thailand 10900

Avg Room Temp : 20 °C
 Avg Water Temp : 20 °C
 Air Pressure : 760.00 mmHg
 Salinity : 0 ppt

Model : YSI 5000
 S/N : 15B100751
 Probe : YSI 5010
 S/N : 22D100097
 ID NO. : -
 Air Temp ref : S/N. F8065C26
 Barometric ref : S/N. F8065C26
 Water Temp ref : -
 ID NO. HS001
 Technician : Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.07	(PASS)	-
Measurement 5 (mg/l)	9.07	(PASS)	-
Measurement 6 (mg/l)	9.07	(PASS)	-
Measurement 7 (mg/l)	9.07	(PASS)	-
Measurement 8 (mg/l)	9.07	(PASS)	-
Measurement 9 (mg/l)	9.07	(PASS)	-
Measurement 10 (mg/l)	9.07	(PASS)	-

Mean Measurement	9.07	mg/l	-	-
Inaccuracy	0.02	mg/l	-	-

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.



QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 24T0774

REFERENCE No : 71986-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0235

ID No : CRB 05/59

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 : 5-Feb-24

APPROVED BY : 

ISSUED DATE : 5-Feb-24

RECEIVED DATE : 5-Feb-24

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 : 24T0774

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : CRB 05/59
RECEIVED DATE : 5-Feb-24
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200
SERIAL NUMBER : 15110C0235
CALIBRATION DATE : 5-Feb-24
RELATIVE HUMIDITY : 52 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

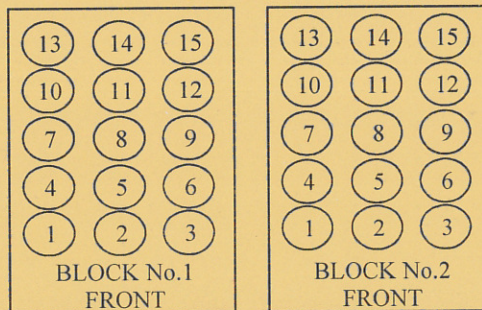
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	8009008	23T6640	14-Jul-24

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.	1	2
Controller temperature (°C)	145	145
Indicating Temperature	145	145
Measured Temperature (°C) at Spread Locations	1	150.2
	2	150.2
	3	150.2
	4	149.9
	5	150.1
	6	150.7
	7	149.9
	8	149.9
	9	150.8
	10	149.5
	11	150.2
	12	150.0
	13	149.5
	14	149.5
	15	149.6
Uncertainty of Measurement(± °C)	0.86	0.86

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

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

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

END OF CALIBRATION REPORT

F-G



QUALITY CALIBRATION CO., LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 25T0520

REFERENCE No : 75853-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0497

ID No : DRB 05/59

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 : 27-Jan-25

APPROVED BY : 

ISSUED DATE : 27-Jan-25

RECEIVED DATE : 15-Jan-25

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, Bangkae, Bangkok 10160

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

CERTIFICATE No : 25T0520

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : DRB 05/59
RECEIVED DATE : 15-Jan-25
AMBIENT TEMPERATURE : 23° C ± 1° C
MODEL : DRB 200
SERIAL NUMBER : 15110C0497
CALIBRATION DATE : 27-Jan-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

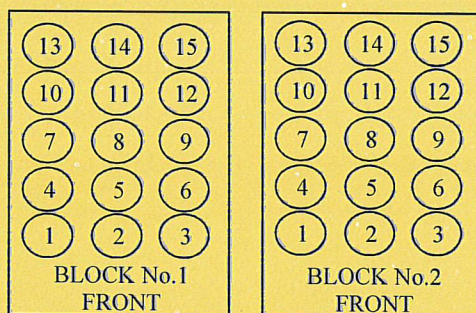
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE .

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	6635300	24T6468	26-Jun-25

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 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	2
Calibration Point (°C)		150	150
Controller temperature (°C)		144	144
Indicating Temperature		144	144
Measured Temperature (° C) at Spread Locations	1	150.01	149.57
	2	150.69	150.44
	3	150.40	149.46
	4	150.22	149.89
	5	150.27	149.75
	6	150.51	150.45
	7	150.24	150.03
	8	150.20	150.08
	9	150.14	150.14
	10	149.70	149.83
	11	149.58	149.89
	12	149.46	149.79
	13	148.77	149.03
	14	148.99	149.14
	15	149.02	149.62
Uncertainty of Measurement(± °C)		0.87	0.87

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

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MU
COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT





CERTIFICATE No : 24M2229
REFERENCE No : 72448-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843


ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 08-Mar-24

APPROVED BY : 

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24



CERTIFICATE No : 24M2229

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE **MODEL** : BSA224S-CW
MANUFACTURER : SARTORIUS **S/N** : 36591843
ID No : BA 09/61 **RECEIVED DATE** : 08-Mar-24
AIR PRESSURE : 1010mbar \pm 1mbar **CALIBRATION DATE** : 08-Mar-24
AMBIENT TEMPERATURE : 25° C \pm 1° C **RELATIVE HUMIDITY** : 55 %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 :-

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

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 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

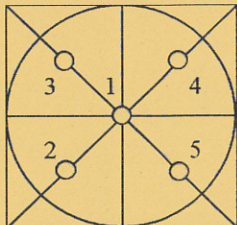
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000082
0.1	0.1000	0.0000	0.000083
0.2	0.2000	0.0000	0.000083
0.5	0.5000	0.0000	0.000083
1.0	1.0000	0.0000	0.000084
2.0	2.0000	0.0000	0.000084
5.0	5.0000	0.0000	0.000086
10.0	10.0000	0.0000	0.000089
20.0	20.0001	-0.0001	0.000094
50.0	50.0000	0.0000	0.00012
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	100.0000
3	100.0000
4	100.0000
5	100.0000
OFF-CENTER LOADING	0.0000

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



CERTIFICATE No : 25M2256

REFERENCE No : 76365-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843


ID No : BA09/61

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 : 07-Mar-25

APPROVED BY : 

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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





CERTIFICATE No : 25M2256

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW
MANUFACTURER : SARTORIUS S/N : 36591843
ID No : BA09/61 RECEIVED DATE : 07-Mar-25
AIR PRESSURE : 1009mbar \pm 1mbar CALIBRATION DATE : 07-Mar-25
AMBIENT TEMPERATURE : 24° C \pm 1° C RELATIVE HUMIDITY : 52 %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 :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) STANDARD WEIGHT SET	E2	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

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 THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

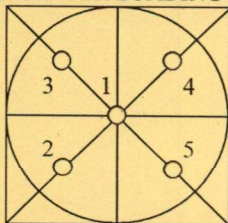
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.0000	0.0000	0.00012
0.10	0.1000	0.0000	0.00012
0.20	0.2000	0.0000	0.00012
0.50	0.5000	0.0000	0.00012
1.00	1.0000	0.0000	0.00012
2.00	2.0000	0.0000	0.00012
5.00	5.0000	0.0000	0.00012
10.00	10.0000	0.0000	0.00012
20.00	20.0001	-0.0001	0.00012
50.00	50.0000	0.0000	0.00014
100.00	100.0001	-0.0001	0.00019
200.00	200.0001	-0.0001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	100.0000
3	100.0000
4	100.0000
5	100.0000
OFF-CENTER LOADING	0.0000

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



ระดับเสียงโดยทั่วไป



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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/N4106495.
7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

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

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

Date of Receipt : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

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

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

FM.BL.MTC.002 Rev.4

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.65	± 0.50	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Ref : 2011267022200795001

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.

FM.BL.MTC.002 Rev.4

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Office

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Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



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

Noise R_157/25

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	21 February 2025
		Due Date	21 February 2026

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R30	ACO	6236	00192042	16 March 2025	93.9	93.9
ACO-R45	ACO	6236	00192057	16 March 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

คุณภาพอากาศในสถานประกอบการ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	1,3-Butadiene	DRYCAL FLOWMETER	RYG_FS0208	13-Feb-24	13-Aug-25	18
		DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
		Air Sampling Pump	RYG_FS0159	7-Jan-25	7-Apr-25	3
		Air Sampling Pump	RYG_FS0130	7-Jan-25	7-Apr-25	3
		GC-MSD	BKK_EN0049	25-Oct-24	25-Apr-26	18

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok
10250

Certificate No : 24-AFM-033
Request No : Req-2024-0241

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator
Manufacturer : Bios
Model : Defender 510-L
Serial Number : 130027
ID : RYG_FS0208
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : -
Sensor Serial Number : -

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 31 January 2024
Calibration Date : 13 February 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Certificate No : 24-AFM-033

Request No : Req-2024-0241

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.50	101.26	20	19.965	0.0	1.3
24.20	101.25	101	100.50	-0.5	2.8
24.00	101.31	200	199.13	-0.9	5.6
23.90	101.42	301	303.56	2.6	8.4
24.10	101.41	401	404.57	4	11
24.10	101.49	480	483.81	3.8	7.0

Note

STD : Standard

UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate

P = Absolute Pressure

T = Absolute Temperature

Meas = Measurement Condition

ref = Standard Condition

* Indicates non accredited

End of Certificate

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : MesaLabs Accuracy : 1% of Reading
Model : Defender 510-M Sensor Model : -
Serial Number : 151114 Sensor Serial Number : -
ID : BKK_FS0614 Instrument Status : Used
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2024
Calibration Date : 9 September 2024
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1003	1001.3	-2	14	10.0	N/A
25.00	100.92	2014	2009.9	-4	29	20.1	N/A
25.20	101.03	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Decision Rule for Statements of Conformity

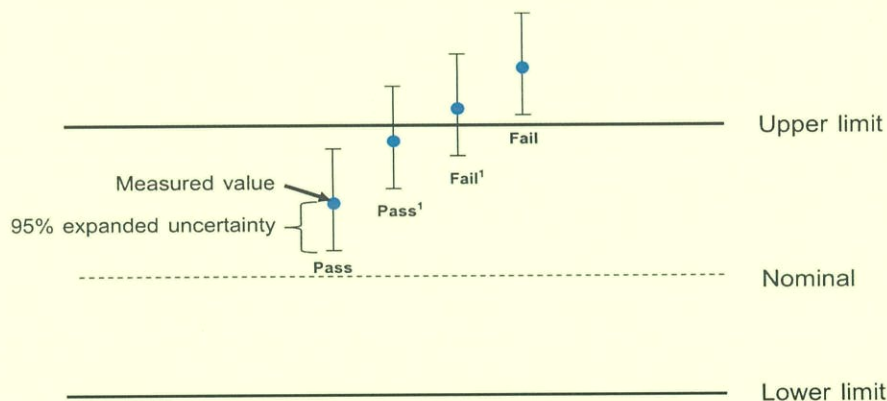
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

**Air Sampling Pump Calibration Report****Air Sampling Pump Detail**

Calibration Date	: 7 Jan 2025	Next cal.	: 7 Apr 2025
Air Sampling Pump ID	: RYG_FS0159	Barometric (mmHg)	: 751
Serial No.	: 20150910031	Temperature (°C)	: 25.0

Reference Standard Low Flow Meter

Brand	: MesaLabs	ID	: RYG_FS0208
Model	: Defender 510-L	Serial No.	: 130027
Due Date	: 13-Aug-25		

Reference Standard High Flow Meter

Brand	: MesaLabs	ID	: BKK_FS0614
Model	: Defender 510-M	Serial No.	: 151114
Due Date	: 21-May-25		

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/min)			Avg. (cc/min)	Acceptable (cc/min)		Evaluation Pass/ Fail
	1	2	3				
20	20.0	20.4	20.5	20.3	21	19	Passed
50	49.5	50.9	48.4	49.6	52.5	47.5	Passed
100	99.8	99.6	99.8	99.7	105	95	Passed
200	199.2	199.4	199.8	199.5	210	190	Passed
500	507.3	510.4	509.1	508.9	515	485	Passed
1000	991.3	990.8	996.5	992.9	1010	990	Passed
2000	2004.9	1993.5	2017.9	2005.4	2020	1980	Passed
2500	2505.1	2515.9	2509.7	2510.2	2550	2450	Passed

Note : Reference Specifications $\pm 5\%$ of set flow or $\pm 3\%$ cc/min whichever is Higher



Air Sampling Pump Calibration Report

Air Sampling Pump Detail

Calibration Date	: 7 Jan 2025	Next cal.	: 7 Apr 2025
Air Sampling Pump ID	: RYG_FS0130	Barometric (mmHg)	: 751
Serial No.	: 20150410006	Temperature (°C)	: 25.0

Reference Standard Low Flow Meter

Brand	: MesaLabs	ID	: RYG_FS0208
Model	: Defender 510-L	Serial No.	: 130027
Due Date	: 13-Aug-25		

Reference Standard High Flow Meter

Brand	: MesaLabs	ID	: BKK_FS0614
Model	: Defender 510-M	Serial No.	: 151114
Due Date	: 21-May-25		

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/min)			Avg. (cc/min)	Acceptable (cc/min)		Evaluation Pass/ Fail
	1	2	3				
20	20.6	20.3	20.3	20.4	21	19	Passed
50	49.8	49.6	50.7	50.0	52.5	47.5	Passed
100	100.9	100.8	100.9	100.9	105	95	Passed
200	200.6	200.4	200.6	200.5	210	190	Passed
500	505.3	505.9	502.6	504.6	515	485	Passed
1000	1007.3	995.7	1009.6	1004.2	1010	990	Passed
2000	2002.1	1998.2	1997.4	1999.2	2020	1980	Passed
2500	2505.3	2514.5	2510.4	2510.1	2550	2450	Passed

Note : Reference Specifications $\pm 5\%$ of set flow or $\pm 3\%$ cc/min whichever is Higher

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-3
Organization Name: ALS Laboratory Group
Organization Location: 104 Phattanakan40, Suan Luang Bangkok 10250

Date: October 25, 2024 12:05:35 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.52, GCMS.02.53
Overall Qualification Status: Pass

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front SSL

Setpoint Status: Pass

	Setpoint	Actual
Inlet Pressure:	25.0 psi	24.9 psi

Accuracy:	0.1 psi
-----------	---------

Agilent Recommended:	<= 1.2
----------------------	--------

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.9 °C

Accuracy: 0.9 °C

Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)
<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.4 °C

Accuracy: 0.4 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)
<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.3333 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Amu:

1050

m/z

Drift After Five Minutes:

11

mV

RFPA Voltage:

524

mV

Agilent Recommended:

>=

-100

and

<=

100

<=

1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Filament:

1

Setpoint Status:

Pass

Filament:

2

Overall Tune EI Test Status

Pass

Scouting Run

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Tested Combination1

Front

SSL

/ External

SQ

Injection Tower

Name:

7693A

Source:

EI - Inert

Setpoint Status:

Completed

Injection Volume on Column:

1.0

uL

Overall Scouting Run Status

Completed

Signal to Noise EI

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Source:

EI - Inert

Filament:

1

Setpoint Status:

Pass

Signal to Noise:

1572

Agilent Recommended:

>=

320

Source:

EI - Inert

Filament:

2

Setpoint Status:

Pass

Signal to Noise:

1541

Agilent Recommended:

>=

320

Overall Signal to Noise EI Test Status

Pass

Injection Precision

Tested Combination1

Front

SSL

/ External

SQ

Name:

7693A

Source:

EI - Inert

Date:

October 25, 2024 12:05:35 PM

System ID:

GM-3

Setpoint Status:

Pass

Injection Volume on Column:

1.0 uL

Area RSD:

0.61 %

Retention Time RSD:

0.01 %

Agilent Recommended:

<= 5.00

<= 1.00

Overall Injection Precision Test Status

Pass

Mass Ratio Precision

Tested Combination1

Front

SSL

/ External

SQ

Injection Tower

Name:

7693A

Source:

EI - Inert

Setpoint Status:

Pass

Injection Volume on Column:

1.0 uL

Area Mass 1

Mass Ratio

Abundance*s

RSD:

0.61 %

0.33 %

Agilent Recommended:

<= 5.00

<= 5.00

Pass

Pass

Overall Mass Ratio Precision Test Status

Pass

Date:

October 25, 2024 12:05:35 PM

System ID:

GM-3

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-3
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN12520102
Firmware Revision	A.10.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN12521119
Firmware Revision	A.01.14
Oven Type	Standard

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Inlet 1

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

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5975C inert XL with TAD
Model Number	G3172A
Serial Number	US13013A11
Firmware Revision	7.02.29
High Vacuum System	Turbo Pump
Scouting Run Standard	MRP Std

MS EI Source 1

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

Electronic Signature

Purpose

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Details

Full Name of Signer:	Adirek Rattanawijit
Logged On User Name:	adirek.rattanawijit@non.agilent.com
Signature Creation Date:	October 25, 2024
Reason for Signature:	Executed protocol and published this original version of document

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:33:46 AM	Audit	SessionCreated	Session	None
October 25, 2024 10:33:46 AM	Start	Configuration	Session	None
October 25, 2024 10:33:46 AM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 25, 2024 10:41:54 AM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.52/Gc.02.52.eqp], EQP File Name: [Gc.02.52.eqp], EQP Name: [AgilentRecommended], Protocol Revision :[Gc.02.52] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.53/GcMs.02.53.eqp], EQP File Name: [GcMs.02.53.eqp], EQP Name: [AgilentRecommended]
October 25, 2024 10:42:30 AM	End	Configuration	Session	None
October 25, 2024 10:42:32 AM	Start	Qualification	Session	OQ
October 25, 2024 10:42:32 AM	Start	Execution	CDS Logon Verification - GC : - Qualitative test	None
October 25, 2024 10:45:20 AM	End	Execution	CDS Logon Verification - GC : - Qualitative test	Run Count : 1

User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:45:22 AM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 25, 2024 10:45:32 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1
October 25, 2024 10:45:34 AM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 25, 2024 10:45:38 AM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 25, 2024 10:45:40 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 25, 2024 10:46:50 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 25, 2024 10:46:52 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 25, 2024 10:46:54 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 25, 2024 10:47:21 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:47:22 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 25, 2024 10:47:23 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 25, 2024 10:48:14 AM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 25, 2024 10:48:15 AM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 25, 2024 10:48:20 AM	Start	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 10:52:15 AM	End	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Inert	Run Count : 1
October 25, 2024 10:52:18 AM	Start	Execution	RFPA - 5975C inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 10:55:41 AM	Start	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
October 25, 2024 10:56:55 AM	End	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
October 25, 2024 10:56:58 AM	Start	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	None

User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:57:25 AM	End	Execution	Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	Run Count : 1
October 25, 2024 10:57:32 AM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	None
October 25, 2024 10:59:48 AM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Data files Path : D:\MassHunter\GCMS\1\data\1\OQPV2024\Scout_001.D
October 25, 2024 11:00:27 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:00:31 AM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Run Count : 1
October 25, 2024 11:00:39 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:01:11 AM	Start	Execution	RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 11:01:37 AM	End	Execution	RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert	Run Count : 1

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User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:01:51 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:02:02 AM	Audit	Data	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	Data files Path : D:\MassHunter\GCMS1\data\10QPV2024\SN_F1_001.D
October 25, 2024 11:04:30 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:04:41 AM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 2000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]

User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:04:50 AM	Audit	Reporting	Reintegration	Reintegration Count: 3 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 2200; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:05:02 AM	Audit	Reporting	Reintegration	Reintegration Count: 4 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 3000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:05:09 AM	Audit	Reporting	Reintegration	Reintegration Count: 5 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 4000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:16:07 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:28:50 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:29:20 AM	End	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	Run Count : 1
October 25, 2024 11:29:23 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_002.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_003.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_004.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_005.D
October 25, 2024 11:29:37 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_006.D

User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:29:37 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_007.D
October 25, 2024 11:29:47 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:29:48 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 25, 2024 11:29:51 AM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	None
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_002.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_003.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_004.D

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data Source: EI - Inert - L (RSD): <= 5.00% D:\MassHunter\GCMS\1\data Source: EI - Inert - L (RSD): <= 5.00% D:\MassHunter\GCMS\1\data Source: EI - Inert - L (RSD): <= 5.00%
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data Source: EI - Inert - L (RSD): <= 5.00% D:\MassHunter\GCMS\1\data Source: EI - Inert - L (RSD): <= 5.00%
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data Source: EI - Inert - L (RSD): <= 5.00% D:\MassHunter\GCMS\1\data Source: EI - Inert - L (RSD): <= 5.00%
October 25, 2024 11:30:15 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:30:17 AM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Run Count : 1
October 25, 2024 11:30:23 AM	End	Qualification	Session	OQ
October 25, 2024 11:30:23 AM	Start	Reporting	Session	None
October 25, 2024 11:34:59 AM	End	Reporting	Session	None
October 25, 2024 11:34:59 AM	Start	Qualification	Session	OQ

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Date:
System ID:October 25, 2024 12:05:35 PM
GM-3

User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:44:32 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	None
October 25, 2024 11:44:39 AM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
October 25, 2024 11:44:42 AM	Audit	Data	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	Data files Path : D:\MassHunter\GCMS\1\data 1\OQPV2024\SN_F2_001.D
October 25, 2024 11:44:53 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 4;]
October 25, 2024 11:45:20 AM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 5; Integration: Off at 7;]
October 25, 2024 11:45:34 AM	End	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	Run Count : 1

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:45:59 AM	End	Qualification	Session	OQ
October 25, 2024 11:45:59 AM	Start	Reporting	Session	None
October 25, 2024 12:03:37 PM	Audit	Reporting	Session	Report Generated : Certificate
October 25, 2024 12:04:58 PM	Audit	Reporting	Session	Report Generated : Report

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok
10250

Certificate No : 24-AFM-033
Request No : Req-2024-0241

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator
Manufacturer : Bios
Model : Defender 510-L
Serial Number : 130027
ID : RYG_FS0208
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : -
Sensor Serial Number : -

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 31 January 2024
Calibration Date : 13 February 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Certificate No : 24-AFM-033

Request No : Req-2024-0241

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.50	101.26	20	19.965	0.0	1.3
24.20	101.25	101	100.50	-0.5	2.8
24.00	101.31	200	199.13	-0.9	5.6
23.90	101.42	301	303.56	2.6	8.4
24.10	101.41	401	404.57	4	11
24.10	101.49	480	483.81	3.8	7.0

Note

STD : Standard

UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate

P = Absolute Pressure

T = Absolute Temperature

Meas = Measurement Condition

ref = Standard Condition

* Indicates non accredited

End of Certificate

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : MesaLabs Accuracy : 1% of Reading
Model : Defender 510-M Sensor Model : -
Serial Number : 151114 Sensor Serial Number : -
ID : BKK_FS0614 Instrument Status : Used
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2024
Calibration Date : 9 September 2024
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1003	1001.3	-2	14	10.0	N/A
25.00	100.92	2014	2009.9	-4	29	20.1	N/A
25.20	101.03	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Decision Rule for Statements of Conformity

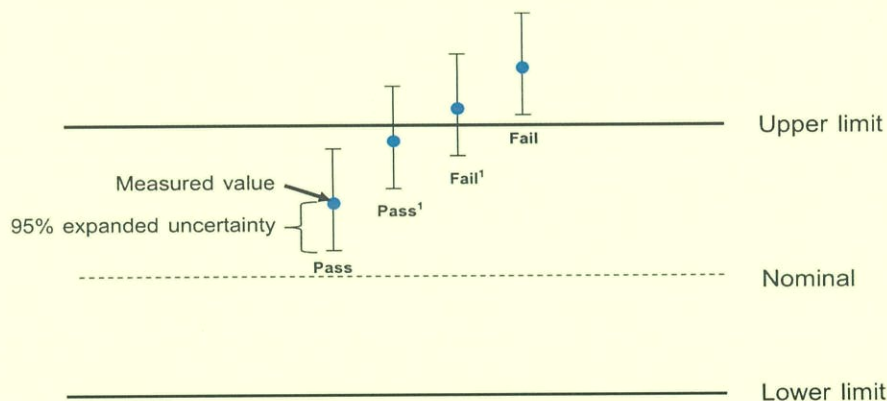
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

**Air Sampling Pump Calibration Report****Air Sampling Pump Detail**

Calibration Date	: 7 Jan 2025	Next cal.	: 7 Apr 2025
Air Sampling Pump ID	: RYG_FS0159	Barometric (mmHg)	: 751
Serial No.	: 20150910031	Temperature (°C)	: 25.0

Reference Standard Low Flow Meter

Brand	: MesaLabs	ID	: RYG_FS0208
Model	: Defender 510-L	Serial No.	: 130027
Due Date	: 13-Aug-25		

Reference Standard High Flow Meter

Brand	: MesaLabs	ID	: BKK_FS0614
Model	: Defender 510-M	Serial No.	: 151114
Due Date	: 21-May-25		

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/min)			Avg. (cc/min)	Acceptable (cc/min)		Evaluation Pass/ Fail
	1	2	3				
20	20.0	20.4	20.5	20.3	21	19	Passed
50	49.5	50.9	48.4	49.6	52.5	47.5	Passed
100	99.8	99.6	99.8	99.7	105	95	Passed
200	199.2	199.4	199.8	199.5	210	190	Passed
500	507.3	510.4	509.1	508.9	515	485	Passed
1000	991.3	990.8	996.5	992.9	1010	990	Passed
2000	2004.9	1993.5	2017.9	2005.4	2020	1980	Passed
2500	2505.1	2515.9	2509.7	2510.2	2550	2450	Passed

Note : Reference Specifications $\pm 5\%$ of set flow or $\pm 3\%$ cc/min whichever is Higher

**Air Sampling Pump Calibration Report****Air Sampling Pump Detail**

Calibration Date	: 7 Jan 2025	Next cal.	: 7 Apr 2025
Air Sampling Pump ID	: RYG_FS0130	Barometric (mmHg)	: 751
Serial No.	: 20150410006	Temperature (°C)	: 25.0

Reference Standard Low Flow Meter

Brand	: MesaLabs	ID	: RYG_FS0208
Model	: Defender 510-L	Serial No.	: 130027
Due Date	: 13-Aug-25		

Reference Standard High Flow Meter

Brand	: MesaLabs	ID	: BKK_FS0614
Model	: Defender 510-M	Serial No.	: 151114
Due Date	: 21-May-25		

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Standard Flow Reading (cc/min)			Avg. (cc/min)	Acceptable (cc/min)		Evaluation Pass/ Fail
	1	2	3				
20	20.6	20.3	20.3	20.4	21	19	Passed
50	49.8	49.6	50.7	50.0	52.5	47.5	Passed
100	100.9	100.8	100.9	100.9	105	95	Passed
200	200.6	200.4	200.6	200.5	210	190	Passed
500	505.3	505.9	502.6	504.6	515	485	Passed
1000	1007.3	995.7	1009.6	1004.2	1010	990	Passed
2000	2002.1	1998.2	1997.4	1999.2	2020	1980	Passed
2500	2505.3	2514.5	2510.4	2510.1	2550	2450	Passed

Note : Reference Specifications $\pm 5\%$ of set flow or $\pm 3\%$ cc/min whichever is Higher

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-3
Organization Name: ALS Laboratory Group
Organization Location: 104 Phattanakan40, Suan Luang Bangkok 10250

Date: October 25, 2024 12:05:35 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.52, GCMS.02.53
Overall Qualification Status: Pass

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front SSL

Setpoint Status: Pass

	Setpoint	Actual
Inlet Pressure:	25.0 psi	24.9 psi
Accuracy:		0.1 psi
Agilent Recommended:	<=	1.2

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.9 °C

Accuracy: 0.9 °C

Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)
<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.4 °C

Accuracy: 0.4 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)
<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.3333 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Amu:

1050

m/z

Drift After Five Minutes:

11

mV

RFPA Voltage:

524

mV

Agilent Recommended:

>=

-100

and

<=

100

<=

1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Filament:

1

Setpoint Status:

Pass

Filament:

2

Overall Tune EI Test Status

Pass

Scouting Run

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Tested Combination1

Front

SSL

/ External

SQ

Injection Tower

Name:

7693A

Source:

EI - Inert

Setpoint Status:

Completed

Injection Volume on Column:

1.0

uL

Overall Scouting Run Status

Completed

Signal to Noise EI

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Source:

EI - Inert

Filament:

1

Setpoint Status:

Pass

Signal to Noise:

1572

Agilent Recommended:

>=

320

Source:

EI - Inert

Filament:

2

Setpoint Status:

Pass

Signal to Noise:

1541

Agilent Recommended:

>=

320

Overall Signal to Noise EI Test Status

Pass

Injection Precision

Tested Combination1

Front

SSL

/ External

SQ

Name:

7693A

Source:

EI - Inert

Date:

October 25, 2024 12:05:35 PM

System ID:

GM-3

Setpoint Status:

Pass

Injection Volume on Column:

1.0

uL

Area RSD:

0.61

%

Retention Time RSD:

0.01

%

Agilent Recommended:

<=

5.00

<=

1.00

Overall Injection Precision Test Status

Pass

Mass Ratio Precision

Tested Combination1

Front

SSL

/ External

SQ

Injection Tower

Name:

7693A

Source:

EI - Inert

Setpoint Status:

Pass

Injection Volume on Column:

1.0

uL

Area Mass 1

Mass Ratio

Abundance*s

RSD:

0.61

%

0.33

%

Agilent Recommended:

<=

5.00

<=

5.00

Pass

Pass

Overall Mass Ratio Precision Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-3
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN12520102
Firmware Revision	A.10.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN12521119
Firmware Revision	A.01.14
Oven Type	Standard

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Inlet 1

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

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5975C inert XL with TAD
Model Number	G3172A
Serial Number	US13013A11
Firmware Revision	7.02.29
High Vacuum System	Turbo Pump
Scouting Run Standard	MRP Std

MS EI Source 1

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

Electronic Signature

Purpose

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Logged On User Name:	adirek.rattanawijit@non.agilent.com
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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:33:46 AM	Audit	SessionCreated	Session	None
October 25, 2024 10:33:46 AM	Start	Configuration	Session	None
October 25, 2024 10:33:46 AM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 25, 2024 10:41:54 AM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.52/Gc.02.52.eqp], EQP File Name: [Gc.02.52.eqp], EQP Name: [Agilent(Recommended)], Protocol Revision :[Gc.02.52] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.53/GcMs.02.53.eqp], EQP File Name: [GcMs.02.53.eqp], EQP Name: [Agilent(Recommended)]
October 25, 2024 10:42:30 AM	End	Configuration	Session	None
October 25, 2024 10:42:32 AM	Start	Qualification	Session	OQ
October 25, 2024 10:42:32 AM	Start	Execution	CDS Logon Verification - GC : - Qualitative test	None
October 25, 2024 10:45:20 AM	End	Execution	CDS Logon Verification - GC : - Qualitative test	Run Count : 1

User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:45:22 AM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 25, 2024 10:45:32 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1
October 25, 2024 10:45:34 AM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 25, 2024 10:45:38 AM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 25, 2024 10:45:40 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 25, 2024 10:46:50 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 25, 2024 10:46:52 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 25, 2024 10:46:54 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 25, 2024 10:47:21 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:47:22 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 25, 2024 10:47:23 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 25, 2024 10:48:14 AM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 25, 2024 10:48:15 AM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 25, 2024 10:48:20 AM	Start	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 10:52:15 AM	End	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Inert	Run Count : 1
October 25, 2024 10:52:18 AM	Start	Execution	RFPA - 5975C inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 10:55:41 AM	Start	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
October 25, 2024 10:56:55 AM	End	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
October 25, 2024 10:56:58 AM	Start	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	None

User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:57:25 AM	End	Execution	Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	Run Count : 1
October 25, 2024 10:57:32 AM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	None
October 25, 2024 10:59:48 AM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Data files Path : D:\MassHunter\GCMS\1\data\1\OQPV2024\Scout_001.D
October 25, 2024 11:00:27 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:00:31 AM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Run Count : 1
October 25, 2024 11:00:39 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:01:11 AM	Start	Execution	RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 11:01:37 AM	End	Execution	RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert	Run Count : 1

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User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:01:51 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:02:02 AM	Audit	Data	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	Data files Path : D:\MassHunter\GCMS1\data\10QPV2024\SN_F1_001.D
October 25, 2024 11:04:30 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:04:41 AM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 2000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]

User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:04:50 AM	Audit	Reporting	Reintegration	Reintegration Count: 3 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 2200; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:05:02 AM	Audit	Reporting	Reintegration	Reintegration Count: 4 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 3000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:05:09 AM	Audit	Reporting	Reintegration	Reintegration Count: 5 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 4000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:16:07 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:28:50 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:29:20 AM	End	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	Run Count : 1
October 25, 2024 11:29:23 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_002.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_003.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_004.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_005.D
October 25, 2024 11:29:37 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_006.D

User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:29:37 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_007.D
October 25, 2024 11:29:47 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:29:48 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 25, 2024 11:29:51 AM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	None
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_002.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_003.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_004.D

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_005.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_006.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_007.D
October 25, 2024 11:30:15 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:30:17 AM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Run Count : 1
October 25, 2024 11:30:23 AM	End	Qualification	Session	OQ
October 25, 2024 11:30:23 AM	Start	Reporting	Session	None
October 25, 2024 11:34:59 AM	End	Reporting	Session	None
October 25, 2024 11:34:59 AM	Start	Qualification	Session	OQ

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:44:32 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	None
October 25, 2024 11:44:39 AM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
October 25, 2024 11:44:42 AM	Audit	Data	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	Data files Path : D:\MassHunter\GCMS\1\data 1\OQPV2024\SN_F2_001.D
October 25, 2024 11:44:53 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 4;]
October 25, 2024 11:45:20 AM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 5; Integration: Off at 7;]
October 25, 2024 11:45:34 AM	End	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	Run Count : 1

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:45:59 AM	End	Qualification	Session	OQ
October 25, 2024 11:45:59 AM	Start	Reporting	Session	None
October 25, 2024 12:03:37 PM	Audit	Reporting	Session	Report Generated : Certificate
October 25, 2024 12:04:58 PM	Audit	Reporting	Session	Report Generated : Report



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	1,3-Butadiene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
		DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
		Air Sampling Pump	RYG_FS0139	6-Apr-25	6-Jul-25	3
		Air Sampling Pump	RYG_FS0140	7-Apr-25	7-Jul-25	3
		GC-MSD	BKK_EN0049	25-Oct-24	25-Apr-26	18

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mesa Labs
Model : 200-510L
Serial Number : 130027
ID : RYG_FS0208
Location of Calibration : LAB 4 AIR VELOCITY METER

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 21 January 2025
Calibration Date : 27 January 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.50	100.90	20	19.854	-0.1	1.3	0.2	Pass1
22.50	100.90	50	49.732	-0.3	3.3	0.5	Pass1
22.60	100.90	101	100.77	-0.2	2.8	1.0	Pass1
22.70	100.90	151	150.23	-0.8	4.2	1.5	Pass1
22.70	100.90	201	200.39	-0.6	5.6	2.0	Pass1
22.70	100.90	301	300.69	-0.3	8.4	3.0	Pass1
22.80	100.90	400	402.96	3.0	11	4.0	Pass1
23.10	100.90	500	504.62	4.6	7.2	5.0	Pass1

Note STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{\text{meas}} = Q_{\text{ref}} \times \frac{P_{\text{ref}}}{P_{\text{meas}}} \times \frac{T_{\text{meas}}}{T_{\text{ref}}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
 Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity.

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Decision Rule for Statements of Conformity

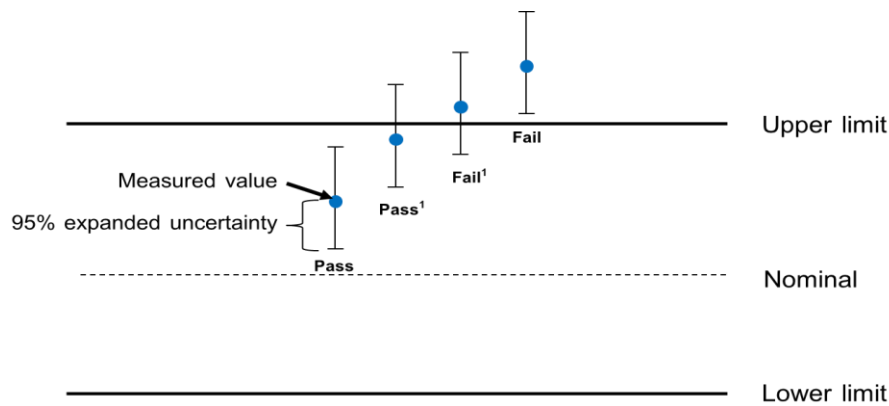
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : MesaLabs Accuracy : 1% of Reading
Model : Defender 510-M Sensor Model : -
Serial Number : 151114 Sensor Serial Number : -
ID : BKK_FS0614 Instrument Status : Used
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2024
Calibration Date : 9 September 2024
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator



Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.



Certificate No : 24-AFM-179

Request No : Req-2024-1987

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1003	1001.3	-2	14	10.0	N/A
25.00	100.92	2014	2009.9	-4	29	20.1	N/A
25.20	101.03	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note STD : Standard UUC : Unit Under Calibration
 - UUC Reference Condition : At atmospheric pressure and room temperature condition
 - Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
 Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Decision Rule for Statements of Conformity

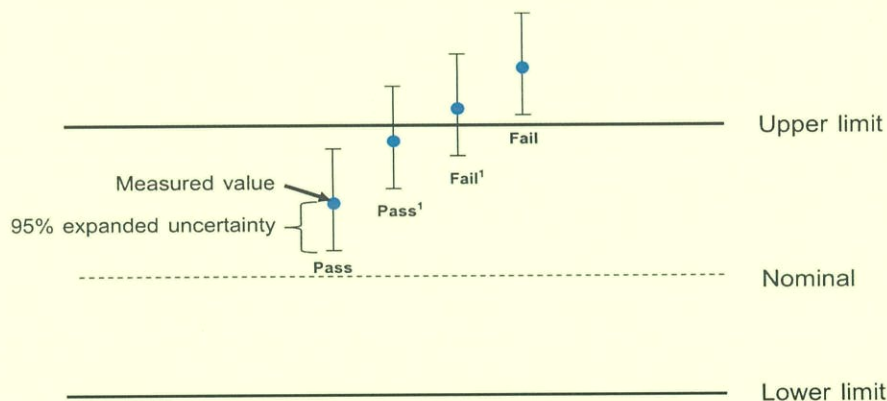
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate



Certificate of Calibration

Certificate No. C-060425-RYG_FS0139

Air Sampling Pump Detail

Equipment name	: Personal Air Sampling Pump	Equipment ID	: RYG_FS0139
Brand	: Gilian	Serial No.	: 20150510087
Model/Type	: GilAir Plus	Calibration Date	: 06-Apr-25
		Next calibration date	: 06-Jul-25

Reference Standard Low Flow Meter

Equipment name	: Air Flow Meter	Equipment ID	: RYG_FS0208
Brand	: MesaLabs	Serial No.	: 130027
Model/Type	: Defender 510-L	Calibration Date	: 27-Jan-25
		Due Date	: 26-Jan-26

Reference Standard High Flow Meter

Equipment name	: Air Flow Meter	Equipment ID	: BKK_FS0614
Brand	: MesaLabs	Serial No.	: 151114
Model/Type	: Defender 510-M	Calibration Date	: 9-Sep-24
		Due Date	: 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)		Evaluation (Pass/ Fail)	
	1	2	3						
Low Flow									
20	20.7	20.5	20.6	20.6	5%	19	-	21	Passed
50	49.5	50.6	49.7	49.9	5%	48	-	53	Passed
100	100.9	100.7	101.0	100.9	5%	95	-	105	Passed
200	200.3	201.1	199.9	200.4	5%	190	-	210	Passed
High Flow									
500	500.5	495.9	505.4	500.6	3%	485	-	515	Passed
1000	1007.4	1002.5	998.8	1002.9	3%	970	-	1030	Passed
2000	2004.3	1992.2	2002.1	1999.5	3%	1940	-	2060	Passed
2500	2502.2	2492.7	2502.6	2499.2	3%	2425	-	2575	Passed

Issue date : 06-Apr-25



Certificate of Calibration

Certificate No. C-070425-RYG_FS0140

Air Sampling Pump Detail

Equipment name	: Personal Air Sampling Pump	Equipment ID	: RYG_FS0140
Brand	: Gilian	Serial No.	: 20150810059
Model/Type	: GilAir Plus	Calibration Date	: 07-Apr-25
		Next calibration date	: 07-Jul-25

Reference Standard Low Flow Meter

Equipment name	: Air Flow Meter	Equipment ID	: RYG_FS0208
Brand	: MesaLabs	Serial No.	: 130027
Model/Type	: Defender 510-L	Calibration Date	: 27-Jan-25
		Due Date	: 26-Jan-26

Reference Standard High Flow Meter

Equipment name	: Air Flow Meter	Equipment ID	: BKK_FS0614
Brand	: MesaLabs	Serial No.	: 151114
Model/Type	: Defender 510-M	Calibration Date	: 9-Sep-24
		Due Date	: 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)			Evaluation (Pass/ Fail)
	1	2	3						
Low Flow									
20	20.2	20.4	20.4	20.3	5%	19	-	21	Passed
50	50.1	51.2	50.9	50.7	5%	48	-	53	Passed
100	99.3	99.6	99.4	99.4	5%	95	-	105	Passed
200	199.8	200.6	200.3	200.2	5%	190	-	210	Passed
High Flow									
500	510.0	511.7	515.7	512.5	3%	485	-	515	Passed
1000	1009.2	1005.8	1012.5	1009.2	3%	970	-	1030	Passed
2000	2015.9	2017.3	1994.6	2009.3	3%	1940	-	2060	Passed
2500	2496.2	2494.2	2504.6	2498.3	3%	2425	-	2575	Passed

RYG Field Services Scientist (1)

RYG Field Services Section Head

Issue date : 07-Apr-25

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-3
Organization Name: ALS Laboratory Group
Organization Location: 104 Phattanakan40, Suan Luang Bangkok 10250

Date: October 25, 2024 12:05:35 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.52, GCMS.02.53
Overall Qualification Status: Pass

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front SSL

Setpoint Status: Pass

	Setpoint	Actual
Inlet Pressure:	25.0 psi	24.9 psi
Accuracy:		0.1 psi
Agilent Recommended:	<=	1.2

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.9 °C

Accuracy: 0.9 °C

Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)
<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.4 °C

Accuracy: 0.4 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)
<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.3333 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Amu:

1050

m/z

Drift After Five Minutes:

11

mV

RFPA Voltage:

524

mV

Agilent Recommended:

>=

-100

and

<=

100

<=

1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Filament:

1

Setpoint Status:

Pass

Filament:

2

Overall Tune EI Test Status

Pass

Scouting Run

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Tested Combination1

Front

SSL

/ External

SQ

Injection Tower

Name:

7693A

Source:

EI - Inert

Setpoint Status:

Completed

Injection Volume on Column:

1.0

uL

Overall Scouting Run Status

Completed

Signal to Noise EI

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Source:

EI - Inert

Filament:

1

Setpoint Status:

Pass

Signal to Noise:

1572

Agilent Recommended:

>=

320

Source:

EI - Inert

Filament:

2

Setpoint Status:

Pass

Signal to Noise:

1541

Agilent Recommended:

>=

320

Overall Signal to Noise EI Test Status

Pass

Injection Precision

Tested Combination1

Front

SSL

/ External

SQ

Name:

7693A

Source:

EI - Inert

Date:

October 25, 2024 12:05:35 PM

System ID:

GM-3

Setpoint Status:

Pass

Injection Volume on Column:

1.0 uL

Area RSD:

0.61 %

Retention Time RSD:

0.01 %

Agilent Recommended:

<= 5.00

<= 1.00

Overall Injection Precision Test Status

Pass

Mass Ratio Precision

Tested Combination1

Front

SSL

/ External

SQ

Injection Tower

Name:

7693A

Source:

EI - Inert

Setpoint Status:

Pass

Injection Volume on Column:

1.0 uL

Area Mass 1

Mass Ratio

Abundance*s

RSD:

0.61 %

0.33 %

Agilent Recommended:

<= 5.00

<= 5.00

Pass

Pass

Overall Mass Ratio Precision Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-3
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN12520102
Firmware Revision	A.10.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN12521119
Firmware Revision	A.01.14
Oven Type	Standard

Date: October 25, 2024 12:05:35 PM
System ID: GM-3

Inlet 1

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

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5975C inert XL with TAD
Model Number	G3172A
Serial Number	US13013A11
Firmware Revision	7.02.29
High Vacuum System	Turbo Pump
Scouting Run Standard	MRP Std

MS EI Source 1

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

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 logon 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:	October 25, 2024
Reason for Signature:	Executed protocol and published this original version of document

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:33:46 AM	Audit	SessionCreated	Session	None
October 25, 2024 10:33:46 AM	Start	Configuration	Session	None
October 25, 2024 10:33:46 AM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 25, 2024 10:41:54 AM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.52/Gc.02.52.eqp], EQP File Name: [Gc.02.52.eqp], EQP Name: [AgilentRecommended], Protocol Revision :[Gc.02.52] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.53/GcMs.02.53.eqp], EQP File Name: [GcMs.02.53.eqp], EQP Name: [AgilentRecommended]
October 25, 2024 10:42:30 AM	End	Configuration	Session	None
October 25, 2024 10:42:32 AM	Start	Qualification	Session	OQ
October 25, 2024 10:42:32 AM	Start	Execution	CDS Logon Verification - GC : - Qualitative test	None
October 25, 2024 10:45:20 AM	End	Execution	CDS Logon Verification - GC : - Qualitative test	Run Count : 1

User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:45:22 AM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 25, 2024 10:45:32 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1
October 25, 2024 10:45:34 AM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 25, 2024 10:45:38 AM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 25, 2024 10:45:40 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 25, 2024 10:46:50 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 25, 2024 10:46:52 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 25, 2024 10:46:54 AM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 25, 2024 10:47:21 AM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:47:22 AM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 25, 2024 10:47:23 AM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 25, 2024 10:48:14 AM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 25, 2024 10:48:15 AM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 25, 2024 10:48:20 AM	Start	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 10:52:15 AM	End	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Inert	Run Count : 1
October 25, 2024 10:52:18 AM	Start	Execution	RFPA - 5975C inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 10:55:41 AM	Start	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
October 25, 2024 10:56:55 AM	End	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
October 25, 2024 10:56:58 AM	Start	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	None

User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 10:57:25 AM	End	Execution	Tune EI - 5975C Inert XL with TAD SQ: - Source: - EI - Inert Filament 2 (Qualitative - No setpoints associated)	Run Count : 1
October 25, 2024 10:57:32 AM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	None
October 25, 2024 10:59:48 AM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Data files Path : D:\MassHunter\GCMS\1\data\1\OQPV2024\Scout_001.D
October 25, 2024 11:00:27 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:00:31 AM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Inert- Part of GCMS System Preparation	Run Count : 1
October 25, 2024 11:00:39 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:01:11 AM	Start	Execution	RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert	None
October 25, 2024 11:01:37 AM	End	Execution	RFPA - 5975C Inert XL with TAD SQ: - Source: EI - Inert	Run Count : 1

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User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:01:51 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:02:02 AM	Audit	Data	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	Data files Path : D:\MassHunter\GCMS1\data\10QPV2024\SN_F1_001.D
October 25, 2024 11:04:30 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:04:41 AM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 2000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]

User Name: adirek.rattanawijit
Report Generated by Hostname: ASBKKWX314

System Id: GM-3
Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:04:50 AM	Audit	Reporting	Reintegration	Reintegration Count: 3 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 2200; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:05:02 AM	Audit	Reporting	Reintegration	Reintegration Count: 4 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 3000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:05:09 AM	Audit	Reporting	Reintegration	Reintegration Count: 5 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 4000; Integration: Off at 0; Integration: On at 4; Integration: Off at 5.6;]
October 25, 2024 11:16:07 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:28:50 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	None
October 25, 2024 11:29:20 AM	End	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 1 - L: >= 320	Run Count : 1
October 25, 2024 11:29:23 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_002.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_003.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_004.D
October 25, 2024 11:29:36 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_005.D
October 25, 2024 11:29:37 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_006.D

User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:29:37 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_007.D
October 25, 2024 11:29:47 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:29:48 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, SQ: - Source: - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 25, 2024 11:29:51 AM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	None
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_002.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_003.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS1\data\OQPV2024\MRP_004.D

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_005.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_006.D
October 25, 2024 11:30:04 AM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Data files Path : D:\MassHunter\GCMS\1\data IQPV2024\MRP_007.D
October 25, 2024 11:30:15 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 5.2;]
October 25, 2024 11:30:17 AM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Inert - L (RSD): <= 5.00%	Run Count : 1
October 25, 2024 11:30:23 AM	End	Qualification	Session	OQ
October 25, 2024 11:30:23 AM	Start	Reporting	Session	None
October 25, 2024 11:34:59 AM	End	Reporting	Session	None
October 25, 2024 11:34:59 AM	Start	Qualification	Session	OQ

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:44:32 AM	Start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	None
October 25, 2024 11:44:39 AM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
October 25, 2024 11:44:42 AM	Audit	Data	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	Data files Path : D:\MassHunter\GCMS\1\data 1\OQPV2024\SN_F2_001.D
October 25, 2024 11:44:53 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 4;]
October 25, 2024 11:45:20 AM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 1000; Integration: Off at 0; Integration: On at 5; Integration: Off at 7;]
October 25, 2024 11:45:34 AM	End	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ: - Source: EI - Inert using Filament 2 - L: >= 320	Run Count : 1

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User Name: adirek.rattanawijit

System Id: GM-3

Report Generated by Hostname: ASBKKWX314

Print Date: October 25, 2024 12:05:37 PM

ALS_OQGCMS_GM-3_2024 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 25, 2024 11:45:59 AM	End	Qualification	Session	OQ
October 25, 2024 11:45:59 AM	Start	Reporting	Session	None
October 25, 2024 12:03:37 PM	Audit	Reporting	Session	Report Generated : Certificate
October 25, 2024 12:04:58 PM	Audit	Reporting	Session	Report Generated : Report

ระดับเสียงในสถานประกอบการ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
 7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be 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 : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

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

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

FM.BL.MTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.81	-0.19	± 0.10	± 0.40 dB

2. Frequency

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

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.95	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 2011268021900739001

End of Certificate

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The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

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

Noise R_244/25

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	21 February 2025
		Due Date	21 February 2026

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R50	ACO	6236	00192062	17 April 2025	93.9	93.9
ACO-R52	ACO	6236	00192064	17 April 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

ปริมาณเสียงสะสมติดตัวบุคคล



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
 7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be 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 : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

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FM.BL.MTC.002 Rev.5

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.81	-0.19	± 0.10	± 0.40 dB

2. Frequency

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

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.95	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 2011268021900739001

End of Certificate

2 / 2

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FM.BL.MTC.002 Rev.5

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Noise R_244/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
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Calibration Range	94 dB, 1000 Hz	Last Calibration	21 February 2025
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Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
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ACO-R50	ACO	6236	00192062	17 April 2025	93.9	93.9
ACO-R52	ACO	6236	00192064	17 April 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	