

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. B27, R01, R03, R07	Digital Balance
Sulfur Dioxide	SO ₂ Analyzer No. B10, R03, R06	SO ₂ Analyzer No. B10, R03, R06
Nitrogen Dioxide	NO/NO ₂ /NO _x Analyzer No. R01, R02, R06	NO/NO ₂ /NO _x Analyzer No. R01, R02, R06
VOCs	Mass Flow Meter	GC/MS
2. คุณภาพอากาศจากแหล่งกำเนิด		
Total Suspended Particulate	Console No. B04 Pitot Tube No. B38	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Sulfur Dioxide	Personal Pump SKC No. B09, B78 Rotameter No. H-R02	Spectrophotometer
Carbon Monoxide	Personal Pump SKC No. B67 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-R03, R12	-
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. B29	-
6. ระดับเสียงสะสมแบบติดตัวบุคคล		
Noise Dose	Acoustic Calibrator Sound Level Meter ACO No. R51	-

คุณภาพอากาศในบรรยากาศ



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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spicon.com, www.spicon.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	03/11/2025	y = 1.118x-3.833	0.997
B02	B02	03/11/2025	y = 1.120x-3.384	0.999
B03	B03	04/11/2025	y = 1.069x-0.968	0.998
B04	B04	03/11/2025	y = 1.096x-2.076	0.996
B05	B05	03/11/2025	y = 1.101x-2.990	0.997
B06	B06	03/11/2025	y = 1.124x-3.707	0.999
B07	B07	03/11/2025	y = 1.133x-2.855	0.999
B08	B08	04/11/2025	y = 1.108x-1.898	0.996
B09	B09	03/11/2025	y = 1.110x-2.993	0.998
B10	B10	03/11/2025	y = 1.116x-3.121	0.999
B11	B11	03/11/2025	y = 1.119x-2.105	0.996
B12	B12	03/11/2025	y = 1.126x-1.525	0.997
B13	B13	05/11/2025	y = 1.093x+0.946	0.998
B14	B14	05/11/2025	y = 1.149x-3.047	0.999
B15	B15	05/11/2025	y = 1.137x-3.875	0.999
B16	B16	03/11/2025	y = 1.079x-2.409	0.998
B17	B17	03/11/2025	y = 1.177x-4.168	0.997
B18	B18	03/11/2025	y = 1.138x-2.900	0.999
B19	B19	03/11/2025	y = 1.109x-1.623	0.996
B20	B20	03/11/2025	y = 1.123x-0.045	0.999
B21	B21	04/11/2025	y = 1.082x+0.484	0.998
B22	B22	04/11/2025	y = 1.110x-1.594	0.996
B23	B23	04/11/2025	y = 1.135x-2.878	0.999
B24	B24	04/11/2025	y = 1.141x-3.242	0.998
B25	B25	03/11/2025	y = 1.011x+3.037	0.997
B26	B26	03/11/2025	y = 1.104x-2.679	0.998
B27	B27	03/11/2025	y = 1.148x-3.947	0.999
B28	B28	03/11/2025	y = 1.120x-3.393	0.998
B29	B29	05/11/2025	y = 1.142x-3.319	0.997
B30	B30	05/11/2025	y = 1.139x-1.015	0.996
B31	B31	05/11/2025	y = 1.152x-2.962	0.997
B32	B32	05/11/2025	y = 1.140x-3.712	0.999
B33	B33	05/11/2025	y = 1.125x-0.806	0.996
B34	B34	04/11/2025	y = 1.150x-3.245	0.996

Calibrated by :


(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



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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	04/11/2025	y = 1.088x-1.183	0.997
B36	B36	04/11/2025	y = 1.131x-2.774	0.996
B37	B37	04/11/2025	y = 1.068x+0.301	0.999
B38	B38	03/11/2025	y = 1.109x-3.757	0.998
B39	B39	03/11/2025	y = 1.027x+0.098	0.999
B40	B40	04/11/2025	y = 1.117x-1.067	0.997
B41	B41	04/11/2025	y = 1.097x-1.570	0.997
B42	B42	04/11/2025	y = 1.142x-3.608	0.997
B43	B43	05/11/2025	y = 1.100x-0.506	0.998
B44	B44	05/11/2025	y = 1.149x-3.077	0.999
R01	R01	05/11/2025	y = 1.114x-0.751	0.998
R02	R02	03/11/2025	y = 1.144x-3.923	0.999
R03	R03	03/11/2025	y = 1.161x-4.126	0.999
R04	R04	03/11/2025	y = 1.113x-2.188	0.997
R05	R05	03/11/2025	y = 1.139x-0.779	0.999
R06	R06	03/11/2025	y = 1.106x-1.148	0.996
R07	R07	03/11/2025	y = 1.128x-3.641	0.999
R08	R08	03/11/2025	y = 1.135x-4.572	0.996
R09	R09	03/11/2025	y = 1.121x-4.112	0.998
R10	R10	03/11/2025	y = 1.117x-2.052	0.999
R11	R11	03/11/2025	y = 1.110x-2.812	0.996
R12	R12	03/11/2025	y = 1.120x-1.259	0.996
R13	R13	04/11/2025	y = 1.146x-5.407	0.998
R14	R14	04/11/2025	y = 1.150x-3.484	0.999
R15	R15	04/11/2025	y = 1.143x-5.066	0.998
R16	R16	04/11/2025	y = 1.153x-6.481	0.996
R17	R17	03/11/2025	y = 1.126x-3.877	0.998
R18	R18	03/11/2025	y = 1.147x-5.065	0.997
R19	R19	03/11/2025	y = 1.119x-4.625	0.999
R20	R20	03/11/2025	y = 1.148x-4.605	0.997

Calibrated by :


(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	30 November 2025	BRAND :	Thermo	MODEL :	43C
NO.	SO2-B10	SERIAL NO.	43C-69604-364		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 29 October 2025			Serial No. : 201-S		
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	24.6	24.5 °C	50	% RH 49
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.11	-	0	
SO ₂ Span	400.0	499.8	24.950	400.0	
INSTRUMENT STATUS					
CHAMBER TEMP	44.5 °C	FLOW	1.0 LPM		
PRESSURE	728.7 mm Hg				

Calibrated by : W. A.
(Mr.Kaseam Simaphon)

Approved by : Yuthama J.
(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R03	SERIAL NO.	3488		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 29 October 2025			Serial No. : 201-S		
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	50
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	1.008
API Model 100E SO ₂ 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	655	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	2882.3	mV	1000-4900		
STR. LGT	61.4	PPB	<100		
DRK PMT	63.1	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2518	mV	2500 ± 200		
RCCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.0	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.008	-	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)		

Calibrated by : W. A.
(Mr.Kaseam Simaphon)

Approved by : Yuthama J.
(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R06	SERIAL NO.	066		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 29 October 2025			Serial No. : 201-S		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A008145K		
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 :	50				
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	400.1	0.025	400.0	1.005
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.3	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.1	mV	-20-150 with Zero Air		
UV LAMP	3075.3	mV	1000-4900		
STR. LGT	60.9	PPB	<100		
DRK PMT	62.8	mV	-50 - 200		
DRK LMP	57.5	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.005	-	1.0 ± 0.3		
SO ₂ Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	200E
NO.	NO _x -R01	SERIAL NO.	769		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 29 October 2025			Serial No. : 201-S		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A006745V		
Certified Date : 12 March 2025			Expired Date : 12 March 2028		
Cylinder Conc. : 48.7 ppm					
CALIBRATING CONDITION					
Pressure :	1011	mmbar	Temp. :	24.6	°C
% RH :	50				
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	400.1	0.025	400.0	1.004
NO _x Span	400	400.3	0.075	400.0	1.006
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	504	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.6	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	770	V	420 - 900 constant		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.1	°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	28.5	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	1.004	-	1.0 ± 0.3		
NO ₂ Slope	1.006	-	1.0 ± 0.3		
NO Offset	0.8	mV	-20 to +150		
NO _x Offset	0.4	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R02	SERIAL NO.	2285		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700E		
Last Cal. Date :	29 October 2025	Serial No. :	201-5		
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A006745V		
Certified Date :	12 March 2025	Expired Date :	12 March 2028	Cylinder Conc. :	48.7 ppm
CALIBRATING CONDITION					
Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.005
NO _x Span	400	400.3	0.075	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	509	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.8	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.3	°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	1.005	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	0.9	mV	-20 to +150		
NO _x Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, 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 :	30 November 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R06	SERIAL NO.	4466		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700E		
Last Cal. Date :	29 October 2025	Serial No. :	201-5		
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A006745V		
Certified Date :	12 March 2025	Expired Date :	12 March 2028	Cylinder Conc. :	48.7 ppm
CALIBRATING CONDITION					
Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.001
NO _x Span	400	400.2	0.050	400.0	1.004
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	506	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCELL PRESS	8.4	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	1.001	-	1.0 ± 0.3		
NO _x Slope	1.004	-	1.0 ± 0.3		
NO Offset	0.9	mV	-20 to +150		
NO _x Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)

Q-SHE SOLUTIONS CO., LTD.

Job Number :	J092500024-003	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 :	20 November 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.	

Part Replacements:

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

Addition Recommended:

- End -

Serviced by :	ชินรส มุขโรจน์	Serviced Date	20 November 2025
Approved by:		Approved Date :	20 November 2025



บริษัท คิว-ซี โซลูชั่นส์ จำกัด

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

Q-SHE SOLUTIONS CO., LTD.

SO₂ Analyzer

Equipment :	Sulfur Dioxide analyzer.	Model :	43I-BZSAB
Serial Number :	CM06280010	Manufacturer :	Thermo Scientific

Parameter	Diagnostic test value		Unit	Nominal range
	Before	After		
Sample reading	3.2	3.4	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
SO ₂ BKG. ppb	25.7	25.3	ppb	0 to 60
SO ₂ COEF	1.027	1.011	-	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	-601.0	-601.0		
Flash Supply	823	823		
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	37.4	37.3	°C	15°C to 45°C
Chamber	44.9	45.4	°C	45°C ± 2°C
Pressure	732.5	735.0	mmHg	750 ± 100 mmHg
Flow	0.624	0.624	L/min	0.5 to 1.00 L/min
Lamp intensity	91	91	%	40 – 100 %

Note :



บริษัท คิว-ซี โซลูชั่นส์ จำกัด

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	7.9	3.4	ppb	
NO _x reading	14.7	7.7	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. ppb	14.9	19.7	ppb	0 to 60
NO _x BKG. ppb	18.4	23.8	ppb	0 to 60
NO COEF.	1.037	1.217	-	1.0 ± 0.3
NO _x COEF.	1.000	0.975	-	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	-902.8	-902.8	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	34.7	34.8	°C	15 °C to 45 °C
Chamber	49.8	50.0	°C	50 °C ± 2 °C
Cooler	-2.8	-2.7	°C	(-3) °C ± 2 °C
Converter	323.4	326.6	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
Pressure	269.4	272.2	mmHg	250 ± 100 mmHg
Flow	0.561	0.568	L/min	0.5 to 1.00 L/min

Note :



บริษัท คิว-ชี โซลูชั่นส์ จำกัด

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

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.

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



Certificate No. : L202412119-0001

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

Capacity Range : 17 ml/min

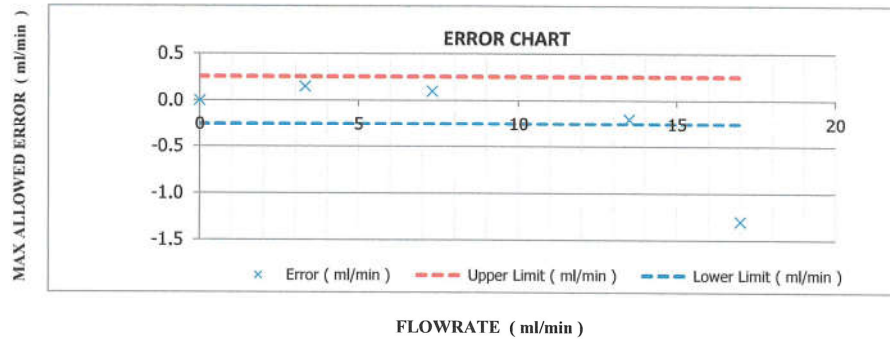
Calibration Media : Air

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

Capacity Range : 17 ml/min

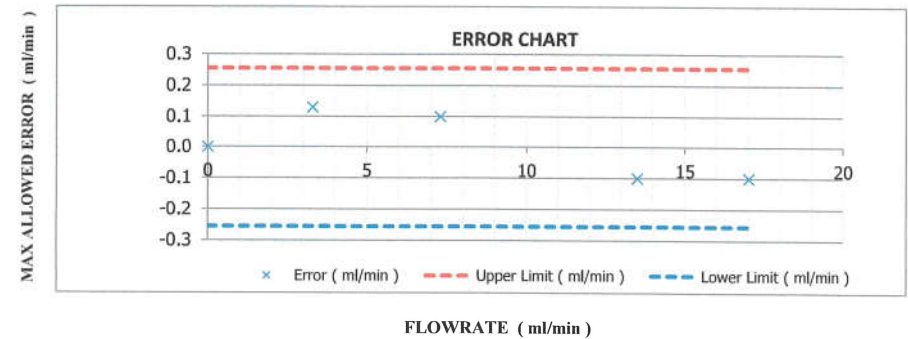
Calibration Media : Air

Type : Mass Flowmeter

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

Temperature ($^{\circ}\text{C}$)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty ($\pm$ ml/min)
24.00	100.45	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

MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwack Rd. Bangpai Bangkoe Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th**CALIBRATION CERTIFICATE**

Page 1 of 3

Certificate No. : L202511307-0001

Date Issued : 01-Dec-25

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 : 27-Nov-25

Date Calibrated : 30-Nov-25

Calibrated by : Nattawat Laochai

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.

Approved by:

K. Nathong
(Nathapong Krudaum)



Certificate No. : L202511307-0001

Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

Capacity Range : 17 ml/min

Calibration Media : Nitrogen

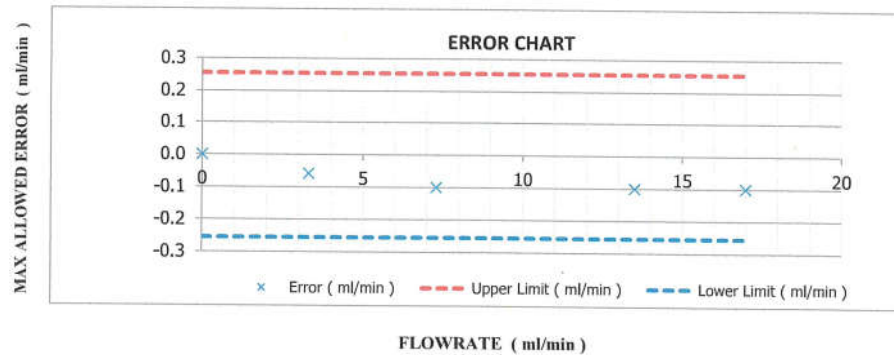
Type : Mass Flowmeter

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

Temperature (° C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)
24.69	101.22	0.00	0.000 *	0.000	0.063
24.44	119.03	3.30	3.358	-0.058	0.14
24.38	118.17	7.30	7.4	-0.10	0.15
24.30	156.08	13.50	13.6	-0.10	0.15
24.25	169.92	17.00	17.1	-0.10	0.18

Error = Unit Under Calibration - Standard

Marked * are not included in the NSC-ONSC accreditation schedule for our laboratory.



Certificate No. : L202511307-0001

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 Calibration Certificate No. MW-0047-24 for Gas Flow meter Serial No. M5209179B/M5209179A, Due 28-Jun-26

NIMT Calibration Certificate No. MW-0048-24 for Gas Flow meter Serial No. M5209179C/M5209179A, Due 02-Jul-26

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 : PONGSAK J.
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.



F-G010 REV 03



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 :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
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.

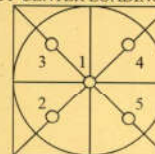
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 120 g WAS 0.000055 g
- 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 MULTIPLIED BY A
COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



F-G010 REV 03

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:	N68APSSFXP
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 6.5
- ☒ Measure all accessible power supply voltages.
 5 Volt Pass
 +15 Volt Pass
 -15 Volt Pass
 24 Volt Pass
- ☒ Record all detector voltage signal.
 Detector Channel A 1.12 mV.
 Detector Channel B NA mV.

3. Diagnostics Tests:

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

4. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.

This Clarus600/680 GC Pass the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative: Monchai Kitcharoenkeat	<i>Monchai</i>	Date: 22-Feb-2025 (DD-MMM-YYYY)
Authorized Customer Representative: Ms.Naruecha	<i>Naruecha</i>	Date: 22-Feb-2025 (DD-MMM-YYYY)

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:	2 of 2
Service Engineer Name:	Monchai Kitcharoenkeat	Service Order Number:	WO-06815714
Date PM Performed: (DD-MMM-YYYY)	13-Aug-2025	Next PM Due Date: (DD-MMM-YYYY)	13-Feb-2026

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 0.32 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

☒ Check oven temperature. Calibrate if necessary.
 Oven temperature set point 150 °C ☒ Pass ☐ Fail

☐ Check sub-ambient option. (If installed).
 Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

- ☒ Check flows, including split flows if applicable. Calibrate if necessary.
Carrier flow Pass
Split flow Pass
- ☒ Check detector gas flows and adjust if necessary.
Detector flow Pass
- ☒ Autosampler installed ☒ Yes ☐ No
Check autosampler sensor for wear and replace if necessary.
Vial sensor Pass
Door sensor Pass
Tower sensor Pass
Plunger sensor Pass
Elevator sensor Pass
- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.
- ☒ Check firmware version. Upgrade to current levels if necessary.
Firmware version 6.5
- ☒ Measure all accessible power supply voltages.
5 Volt Pass
+15 Volt Pass
-15 Volt Pass
24 Volt Pass
- ☒ Record all detector voltage signal.
Detector Channel A 0.98 mV.
Detector Channel B NA mV.

3. Diagnostics Tests:

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

4. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.

This Clarus600/680 GC Pass the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative: Monchai Kitcharoenkeat <i>Monchai</i>	Date: 13-Aug-2025 (DD-MM-YYYY)
Authorized Customer Representative: Ms.Naruecha <i>Naruecha</i>	Date: 13-Aug-2025 (DD-MM-YYYY)

คุณภาพอากาศจากแหล่งกำเนิด



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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

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	01/10/2025	500	1,000	2,000	501.1	997.7	1996.7	1.000x - 2.348	0.999
H-R02	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.3	999.2	1997.5	1.001x - 2.181	1.000
H-R03	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	500.9	1001.1	1999.3	0.999x + 0.708	0.999
H-R04	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	501.4	999.4	1998.9	0.997x + 3.139	1.000
H-R05	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.5	1000.7	1998.2	0.998x + 2.480	1.000
H-R06	Dwyer	VFB-65	03/10/2025	500	1,000	2,000	502.0	998.5	1994.8	1.000x - 1.968	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

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
B01	SKC	224-PCXR4	262101	03/10/2025	1,000	1,500	2,000	998	1,490	1,997	1.000x - 7.191	1.000
B02	SKC	224-PCXR4	626166	03/10/2025	1,000	1,500	2,000	1,007	1,500	2,008	0.999x + 2.537	1.000
B03	SKC	224-PCXR4	612968	03/10/2025	1,000	1,500	2,000	1,003	1,503	2,001	0.997x + 0.810	0.999
B04	SKC	224-PCXR4	602804	02/10/2025	1,000	1,500	2,000	998	1,494	1,999	1.001x - 6.035	1.000
B05	SKC	224-PCXR4	612693	02/10/2025	1,000	1,500	2,000	999	1,495	2,001	0.999x - 2.481	1.000
B06	SKC	224-PCXR4	262188	02/10/2025	1,000	1,500	2,000	997	1,510	2,000	0.998x + 0.064	0.999
B07	SKC	224-PCXR4	626262	01/10/2025	1,000	1,500	2,000	1,004	1,492	2,007	1.002x - 4.778	1.000
B08	SKC	224-PCXR4	626100	02/10/2025	1,000	1,500	2,000	1,005	1,500	2,005	1.004x - 7.223	1.000
B09	SKC	224-PCXR4	626479	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,996	0.996x + 3.462	0.999
B10	SKC	224-PCXR4	091950	01/10/2025	1,000	1,500	2,000	997	1,504	2,000	1.003x - 8.822	1.000
B11	SKC	224-PCXR8	564315	03/10/2025	1,000	1,500	2,000	1,001	1,503	1,995	0.995x + 2.449	1.000
B12	SKC	224-PCXR4	030656	03/10/2025	1,000	1,500	2,000	997	1,506	2,003	1.003x - 9.062	0.999
B13	SKC	224-PCXR4	602073	03/10/2025	1,000	1,500	2,000	1,003	1,497	2,004	1.002x - 5.013	1.000
B14	SKC	224-PCXR4	626313	03/10/2025	1,000	1,500	2,000	998	1,501	1,992	1.005x - 11.702	0.999
B15	SKC	224-PCXR4	626474	03/10/2025	1,000	1,500	2,000	1,001	1,502	2,004	1.006x - 11.694	1.000
B16	SKC	224-PCXR4	626477	03/10/2025	1,000	1,500	2,000	996	1,498	1,992	1.007x - 16.329	0.999
B17	SKC	224-PCXR4	626860	02/10/2025	1,000	1,500	2,000	1,001	1,503	1,998	1.001x - 4.838	1.000
B18	SKC	224-PCXR4	691484	01/10/2025	1,000	1,500	2,000	997	1,514	1,996	0.996x + 5.560	1.000
B19	SKC	224-PCXR4	691599	01/10/2025	1,000	1,500	2,000	998	1,499	2,003	0.998x + 0.399	1.000
B20	SKC	224-PCXR4	691587	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,999	0.995x + 1.520	0.999
B21	SKC	224-PCXR4	691531	03/10/2025	1,000	1,500	2,000	996	1,502	2,001	1.003x - 7.151	1.000
B22	SKC	224-PCXR4	691654	03/10/2025	1,000	1,500	2,000	1,001	1,500	1,998	0.997x - 0.464	1.000
B23	SKC	224-PCXR4	798393	03/10/2025	1,000	1,500	2,000	993	1,507	1,999	1.007x - 17.505	0.999
B24	SKC	224-PCXR4	626363	03/10/2025	1,000	1,500	2,000	994	1,498	1,995	1.000x - 3.941	1.000
B25	SKC	224-PCXR4	798489	01/10/2025	1,000	1,500	2,000	1,003	1,490	2,001	0.997x + 1.703	1.000
B26	SKC	224-PCXR4	798479	01/10/2025	1,000	1,500	2,000	1,001	1,509	1,995	1.002x - 8.057	0.999
B27	SKC	224-PCXR4	691673	01/10/2025	1,000	1,500	2,000	998	1,510	2,002	1.005x - 9.656	1.000
B28	SKC	224-PCXR4	691570	01/10/2025	1,000	1,500	2,000	1,011	1,508	2,009	0.999x + 3.729	0.999
B29	SKC	224-PCXR4	626472	01/10/2025	1,000	1,500	2,000	1,002	1,503	1,998	1.002x - 6.066	1.000
B30	SKC	224-PCXR4	691489	01/10/2025	1,000	1,500	2,000	997	1,506	2,001	1.004x - 8.049	1.000
B31	SKC	224-PCXR4	691509	02/10/2025	1,000	1,500	2,000	996	1,497	1,992	0.998x - 2.293	1.000
B32	SKC	224-PCXR4	091567	01/10/2025	1,000	1,500	2,000	1,002	1,500	2,003	1.006x - 15.778	0.999
B33	SKC	224-PCXR4	091756	02/10/2025	1,000	1,500	2,000	1,003	1,501	1,997	1.003x - 6.509	1.000
B34	SKC	224-PCXR4	612962	01/10/2025	1,000	1,500	2,000	996	1,512	1,996	1.001x - 5.867	0.999
B35	SKC	224-PCXR4	602682	01/10/2025	1,000	1,500	2,000	1,008	1,494	1,999	0.993x + 6.592	1.000
B36	SKC	224-PCXR4	626164	01/10/2025	1,000	1,500	2,000	997	1,502	1,992	0.999x - 5.235	1.000
B37	SKC	224-PCXR4	626256	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,997	0.994x + 5.093	1.000
B38	SKC	224-PCXR4	626167	02/10/2025	1,000	1,500	2,000	998	1,513	1,995	1.000x - 5.277	0.999
B39	SKC	224-PCXR4	030637	03/10/2025	1,000	1,500	2,000	1,007	1,504	2,004	0.996x + 8.240	1.000
B40	SKC	224-PCXR4	798349	03/10/2025	1,000	1,500	2,000	998	1,510	2,002	0.998x + 3.905	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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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 : 136164

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.)			y	R ²
					1	2	3	1	2	3		
B41	SKC	224-PCXR4	612669	01/10/2025	1.000	1.500	2.000	1.010	1.508	2.009	1.000x + 2.612	0.999
B42	SKC	224-PCXR4	626041	02/10/2025	1.000	1.500	2.000	1.004	1.494	1.994	0.997x + 1.364	1.000
B43	SKC	224-PCXR4	056636	01/10/2025	1.000	1.500	2.000	998	1.505	2.002	1.001x - 5.177	1.000
B44	SKC	224-PCXR8	529341	01/10/2025	1.000	1.500	2.000	999	1.496	1.998	0.996x + 0.909	1.000
B45	SKC	224-PCXR8	529594	01/10/2025	1.000	1.500	2.000	996	1.510	1.992	1.005x - 11.543	1.000
B46	SKC	224-PCXR8	566743	01/10/2025	1.000	1.500	2.000	1.003	1.488	1.997	0.994x + 3.717	1.000
B47	SKC	224-PCXR8	566747	01/10/2025	1.000	1.500	2.000	1.004	1.500	1.993	0.996x + 2.230	1.000
B48	SKC	224-PCXR8	566753	01/10/2025	1.000	1.500	2.000	1.002	1.501	1.991	1.000x - 4.116	0.999
B49	SKC	224-PCXR8	566780	01/10/2025	1.000	1.500	2.000	995	1.502	1.990	0.997x - 1.978	1.000
B50	SKC	224-PCXR8	500400	02/10/2025	1.000	1.500	2.000	997	1.503	2.001	1.004x - 10.178	1.000
B51	SKC	224-PCXR8	500363	01/10/2025	1.000	1.500	2.000	1.001	1.502	1.993	0.995x + 2.848	1.000
B52	SKC	224-PCXR8	093186	03/10/2025	1.000	1.500	2.000	996	1.510	1.999	1.005x - 12.252	0.999
B53	SKC	224-PCXR8	707670	03/10/2025	1.000	1.500	2.000	1.002	1.496	2.004	1.003x - 8.791	1.000
B54	SKC	224-PCXR3	509821	03/10/2025	1.000	1.500	2.000	999	1.501	1.995	0.999x - 2.090	1.000
B55	SKC	224-PCXR3	510710	02/10/2025	1.000	1.500	2.000	1.002	1.503	2.006	1.007x - 13.250	0.999
B56	SKC	224-PCXR3	511450	01/10/2025	1.000	1.500	2.000	995	1.505	1.997	1.002x - 7.594	1.000
B57	SKC	224-PCXR3	510798	02/10/2025	1.000	1.500	2.000	998	1.500	1.994	0.999x - 7.163	0.999
B58	SKC	224-PCXR3	509852	03/10/2025	1.000	1.500	2.000	1.002	1.494	1.996	0.993x + 6.485	1.000
B59	SKC	224-PCXR3	509862	01/10/2025	1.000	1.500	2.000	1.006	1.505	1.998	0.996x + 5.117	1.000
B60	SKC	224-PCXR3	512655	02/10/2025	1.000	1.500	2.000	1.004	1.501	2.003	1.010x - 14.223	0.999
B61	SKC	224-PCXR3	503915	03/10/2025	1.000	1.500	2.000	993	1.495	1.994	0.999x - 4.942	1.000
B62	SKC	224-PCXR3	505973	03/10/2025	1.000	1.500	2.000	995	1.500	2.005	1.009x - 16.396	1.000
B63	SKC	224-PCXR3	511432	03/10/2025	1.000	1.500	2.000	996	1.497	1.991	0.998x - 3.171	1.000
B64	SKC	224-PCXR3	508302	03/10/2025	1.000	1.500	2.000	1.008	1.506	1.998	0.992x + 8.667	0.999
B65	SKC	224-PCXR3	508310	03/10/2025	1.000	1.500	2.000	1.006	1.492	2.003	1.000x - 4.355	1.000
B66	SKC	224-PCXR3	509861	03/10/2025	1.000	1.500	2.000	994	1.496	1.994	0.997x - 0.275	1.000
B67	SKC	224-PCXR3	506295	01/10/2025	1.000	1.500	2.000	997	1.505	2.001	1.004x - 10.258	1.000
B68	SKC	224-PCXR3	505872	03/10/2025	1.000	1.500	2.000	998	1.512	1.992	0.999x - 3.554	0.999
B69	SKC	224-PCXR3	508373	01/10/2025	1.000	1.500	2.000	997	1.489	1.996	0.997x - 2.309	1.000
B70	SKC	224-PCXR3	510623	03/10/2025	1.000	1.500	2.000	1.001	1.496	1.991	0.992x + 7.131	1.000
B71	SKC	224-PCXR3	508367	03/10/2025	1.000	1.500	2.000	999	1.498	1.995	0.994x + 6.433	1.000
B72	SKC	224-PCXR3	505977	03/10/2025	1.000	1.500	2.000	996	1.507	1.999	1.003x - 7.490	1.000
B73	SKC	224-PCXR3	512606	03/10/2025	1.000	1.500	2.000	1.004	1.503	2.003	1.001x - 5.285	0.999
B74	SKC	224-PCXR3	505993	01/10/2025	1.000	1.500	2.000	1.006	1.501	1.997	0.993x + 8.232	1.000
B75	SKC	224-PCXR3	509820	02/10/2025	1.000	1.500	2.000	1.005	1.494	1.995	0.997x - 2.979	0.999
B76	SKC	224-PCXR3	509811	02/10/2025	1.000	1.500	2.000	996	1.503	1.999	1.005x - 10.613	1.000
B77	SKC	224-PCXR3	508301	01/10/2025	1.000	1.500	2.000	1.003	1.490	1.998	0.994x + 4.694	1.000
B78	SKC	224-PCXR3	510677	01/10/2025	1.000	1.500	2.000	1.004	1.492	1.997	0.995x + 4.026	1.000
B79	SKC	224-PCXR3	510920	01/10/2025	1.000	1.500	2.000	1.008	1.504	2.006	1.006x - 9.588	0.999

Calibrated by :

Adul Dangkom
(Mr. Adul Dangkom)

Approved by :

Peeru Detudom
(Mr. Peeru Detudom)



CALIBRATION LABORATORY Co.,LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-6353-4 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[64-220088-1]

CLID.NO.

212301422

JOB CONTROL NO.

240720076546

CUSTOMER

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

7 SOI PHAHOLYOTHrN 24 ROAD,, JOMPOL,

CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED: 24 July 2025

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

Calibrated By :

Sittipong Pimdee

Calibration Engineer

Approved By :

Mongkol Yotsoontorn

Authorized Signatory

24 July 2025



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. Q24076546

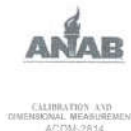
F3-011-05/12-23

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

211Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-Q353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE	VACUUM GAUGE
MANUFACTURER	HI-LIGHT
MODEL/TYPE	N/A
SERIAL NO.	N/A [64-220088-1]
DATE OF CALIBRATION	23 July 2025
DUE DATE OF CALIBRATION	23 July 2026

ENVIRONMENT CONDITIONS

Temperature : (23 $\pm$ 2) °C

Relative Humidity (55 $\pm$ 10) %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.

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. Q24076546

F3-011-05/12-23

page 2 of 3



CALIBRATION LABORATORY Co., LTD.

211Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-D353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



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	0.00	0.00	0.0	0.0	0.0	0.0
-5	-15.07	-15.10	-4.5	-4.5	+0.5	+0.5
-10	-32.50	-32.84	-9.6	-9.7	+0.4	+0.3
-15	-49.44	-49.77	-14.6	-14.7	+0.4	+0.3
-20	-66.70	-66.70	-19.7	-19.7	+0.3	+0.3
-25	-83.63	-83.97	-24.7	-24.8	+0.3	+0.2
-30	-100.39	-100.39	-29.6	-29.6	+0.4	+0.4

Uncertainty of measurement $\pm$ 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. Q24076546

F3-011-05/ 12-23

page 3 of 3



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

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_{g} (mmH ₂ O)
B01	1563	05/09/2025	1.004	49.67
B02	8002514	01/09/2025	1.002	49.85
B03	1503016	01/09/2025	1.005	49.77
B04	00006659	04/09/2025	0.997	49.93
B05	00007428	02/09/2025	1.003	49.51
R01	1561	01/09/2025	0.999	49.82
R02	8002513	01/09/2025	0.996	49.94
R03	1570	04/09/2025	0.998	50.02
R04	8002519	04/09/2025	1.002	49.89
R05	1503015	02/09/2025	0.996	50.10

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

Accept Value of ΔH_{g} (test) is 46.7 ± 6.4 (mmH₂O)

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Signature)
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
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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

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	03/11/2025	0.85	0.84
B37	S	0.99	03/11/2025	0.84	0.84
B38	S	0.99	03/11/2025	0.84	0.84
B39	S	0.99	06/11/2025	0.84	0.85
B40	S	0.99	06/11/2025	0.84	0.84
B41	S	0.99	04/11/2025	0.85	0.84
B44	S	0.99	03/11/2025	0.84	0.84
B45	S	0.99	03/11/2025	0.84	0.84
B46	S	0.99	03/11/2025	0.85	0.84
B47	S	0.99	04/11/2025	0.84	0.83
B48	S	0.99	04/11/2025	0.85	0.84
B49	S	0.99	04/11/2025	0.84	0.84
B54	S	0.99	05/11/2025	0.85	0.84
B56	S	0.99	05/11/2025	0.84	0.85
B57	S	0.99	05/11/2025	0.84	0.84
B58	S	0.99	04/11/2025	0.84	0.85

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Signature)
(Mr. Peera Detudom)



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 : PONGSAK J.
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.



F-G010 REV 03



CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

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

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
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.

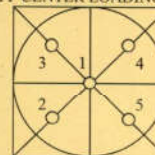
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 120 g WAS 0.000055 g
- 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 MULTIPLIED BY A
COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



F-G010 REV 03



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@spscs.com, www.spscs.com

Calibration Report			
Non-Dispersive Infrared CO Analyzer			
Date :	01 December 2025	Brand :	API
No.	CO-B02	Model :	300E
		Serial No.	965
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	01 September 2025	Serial No.	911
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. :	24.6 °C
		% RH :	50
Calibration Setting			
Span	Initial Reading (Before Adj.), PPM		Final Reading (After Adj.), PPM
Set Point	Expected Concentration	Analyzer Response	%Diff
Zero	0	-0.10	-
CO Span	40.00	39.94	-0.150
			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	4017.2	mV	2500-4800 mV
CO Reference	3948.8	mV	2500-4800 mV
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air
Sample Pressure	28.5	In-Hg-A	-2" < Ambient Absolute Pressure
Sample Flow	810	CC/Min	800 ± 10%
Sample Temperature	48.2	°C	48 ± 4
Bench Temperature	48.0	°C	48 ± 2
Wheel Temperature	68.5	°C	68 ± 2
Box Temperature	30.6	°C	Ambient Temp. + 7 ± 10
Photo-Drive	3034.9	mV	250 mV to 4750 mV
Slope	1.017	-	1.0 ± 0.3
Offset	0.2	-	0 ± 0.3

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)

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. : SP25026

Pages : 1 of 4

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER
Manufacturer : PERKINELMER
Model : LAMBDA 25
Serial No.: 501S14123010
ID No.: SP03/58
Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY
STRAY LIGHT

Condition As Found : GOOD

Customer : S.P.S CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,
CHOMPHON SUB-DISTRICT, CHATUCHAK DISTRICT,
BANGKOK PROVINCE 10900 THAILAND.

Location : ORGANIC LABORATORY IV

Ambient Temperature : (22.9 ± 5) °C

Relative Humidity : (53.7 ± 25) %

Received Date : 22 AUGUST 2025

Calibration Date : 22 AUGUST 2025

Date of Issue : 25 AUGUST 2025

Calibrated by :

Nitinun Srihawan

Approved by :

Wichok B.
(Wichok Ekpongpradit)

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

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 2 of 4

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	126461	24/10/2026
Didymium liquid	RM-DL	28912	126462	24/10/2026
Neutral density filter	RM-1N2N3N	13877	126457	24/10/2026
Potassium dichromate solutions	RM-0204060810	14204	126497	25/10/2026
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)

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	278.21	0.08	0.16	2.00
	361.25	361.39	0.14	0.16	2.00
	467.82	467.71	-0.11	0.16	2.00
	536.56	536.50	-0.06	0.16	2.00
	640.50	640.36	-0.14	0.16	2.00
RM-DL	740.09	739.85	-0.24	0.16	2.00
	864.94	865.12	0.18	0.16	2.00

UUC* = Unit Under Calibration

Michael B.

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 3 of 4

Result of calibration : Photometric Accuracy

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	29381	0.5	0.5443	0.5413	-0.0030	0.0043	2.00
		29914	0.7	0.7484	0.7455	-0.0029	0.0054	2.00
		29360	1.0	1.0527	1.0535	0.0008	0.0032	2.00
	465.0	29381	0.5	0.4948	0.4922	-0.0026	0.0041	2.00
		29914	0.7	0.6906	0.6877	-0.0029	0.0050	2.00
		29360	1.0	0.9695	0.9709	0.0014	0.0031	2.00
	546.1	29381	0.5	0.5090	0.5068	-0.0022	0.0036	2.00
		29914	0.7	0.6985	0.6960	-0.0025	0.0041	2.00
		29360	1.0	0.9814	0.9825	0.0011	0.0031	2.00
	590.0	29381	0.5	0.5375	0.5353	-0.0022	0.0034	2.00
		29914	0.7	0.7256	0.7231	-0.0025	0.0037	2.00
		29360	1.0	1.0213	1.0219	0.0006	0.0032	2.00
	635.0	29381	0.5	0.5223	0.5202	-0.0021	0.0033	2.00
		29914	0.7	0.6927	0.6901	-0.0026	0.0036	2.00
		29360	1.0	0.9744	0.9750	0.0006	0.0032	2.00

UUC* = Unit Under Calibration

Michael B.

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 4 of 4

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Potassium dichromate solutions	235.0	20	0.2415	0.2443	0.0028	0.0101	2.00
		40	0.4866	0.4871	0.0005	0.0115	2.00
		60	0.7415	0.7295	-0.0120	0.0067	2.00
		80	0.9854	0.9844	-0.0010	0.0071	2.00
		100	1.2444	1.2425	-0.0019	0.0073	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 0.001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance
Wavelength Scan 190 nm - 1100 nm
Scanning Speed 7.5 nm/min
Band width(Wavelength) 1.0
Band width(Vis) 1.0
Band width(Uv) 1.0

Stray Light** UUC* Reading at 220.0 nm	
Transmission T(%)	Absorbance(A)
0.020	3.7032

**Specific Acceptance :
Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A
**Stray light not TISI Accredited

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

End of Calibration Certificate



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 : pH METER
MANUFACTURER : HANNA
MODEL / TYPE : HI3512/HI1332/HI7662-T
SERIAL NO. : 08685754/11250B7M/092806BN[PH04/56]
CLID. NO. : 272501562
JOB CONTROL NO. : 250617070523
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 : 17 June 2025

DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seechanart
Wenick Inchaisri
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
20 June 2025



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. Q25070523

F3-011-05/12-23

page 1 of 4



@clccalibration



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



REPORT OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : HANNA
MODEL / TYPE : HI3512/HI1332/HI7662-T
SERIAL NO. : 08685754/11250B7M/092806BN[PH04/56]
DATE OF CALIBRATION : 18 June 2025

ENVIRONMENT CONDITIONS :

Temperature : $(25 \pm 2.5) ^\circ\text{C}$ Relative Humidity : $(50 \pm 15) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPCH-01 [pH Meter]. The calibration was performed by direct measurement with Certified Reference Material (CRM).

This instrument was calibrated under procedure No. CLC-CPTH-04 [Temperature] based on ASTM E 644-04 as calibration guidelines. The calibration was performed by using Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664260,11754256, Lot Number CC787362.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

Certificate No. Q25070523

F3-011-05/12-23

page 2 of 4



@clccalibration



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



TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).
Lot Number. 080124 , 120124. Due Date 23 January 2026.
2. The measurements are traceable to International System of Units (SI) , through Control Company.
Certificate No. 4281-14495731 , Due Date 27 September 2025.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.
Certificate No. Q24120999, Due Date 26 November 2025.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1042/67, Due Date 16 October 2025.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).
Certificate No. TT-0146-24, Due Date 28 October 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration



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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement ($\pm$ pH)	k Factor
4.003	4.005	168.2	-0.002	0.010	2,00
7.005	7.010	-8.1	-0.005	0.013	2,00
10.015	10.010	-177.7	+0.005	0.014	2,00

Technical Note. Setting function CAL 3 point (4,7,10).

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 4 of 68

2. TEMPERATURE RESULT

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty $\pm$ (°C)
100	25.00	25.0	0.00	0.07

Technical Note. Type of sensor : Thermistor

Probe $\varnothing$ 3 mm

Materials : Metal Sheath.

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2,00$.

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 56 of 68

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

End of Certificate

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration



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

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

Harikul Science Co.,Ltd.
694 Soi Ratchadanivet 24, Pracharatbamphen,
Samsaennok, Huaikhwang, Bangkok 10310
Tel: 0-2274-2456 Fax: 0-2274-2443
Email: info@harikul.com www.harikul.com
Certificate of Calibration

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.

Technician Signature
(Kittipong Maekwong)

Laboratory Manager
(Natenapha Pisatkunchon)



QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkac, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com

CERTIFICATE No : 25T0521
REFERENCE No : 75853-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
MODEL : DRB 200
SERIAL No : 15110C0498
ID No : CRB 06/59
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 : 03-Feb-25

APPROVED BY : PONGSAK J.

ISSUED DATE : 03-Feb-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.





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 : 25T0521

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : CRB 06/59
RECEIVED DATE : 15-Jan-25
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200
SERIAL NUMBER : 15110C0498
CALIBRATION DATE : 03-Feb-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

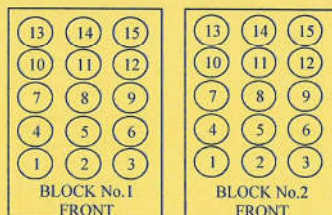
CONDITION OF THIS RESULTS OF CALIBRATION

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 7301307 24T6467 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)	145	145
Indicating Temperature	145	145
Measured Temperature (°C) at Spread Locations	1	150.23
	2	149.73
	3	150.29
	4	150.04
	5	150.09
	6	150.74
	7	149.97
	8	150.76
	9	150.54
	10	149.44
	11	150.12
	12	149.93
	13	149.19
	14	148.96
	15	149.09
Uncertainty of Measurement (± °C)	0.88	0.88

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 MULTIPLIED BY A COVERAGE FACTOR k = 2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



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

www.qcalibration.com



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 : PONGSAK J.

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.



F-G010 REV 03



QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com

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 :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-1-151	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

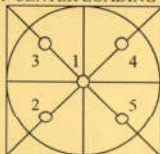
2. TARE FUNCTION : NORMAL

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



F-G010 REV 03

ระดับเสียงโดยทั่วไป



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 ± 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 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

1 / 2

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

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

FM.BLMTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office

196 Phahonyothin Road, Ladyao, Chatuchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827



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 20μPa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone 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	±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	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Signature)
(Mr.Weerachai Deechaiyae)

Approved by :

(Signature)
(Mr.Prawate Kluaypa)
Director

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

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

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FM.BLMTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office

196 Phahonyothin Road, Ladyao, Chatuchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827

Noise R_705/25

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-R03	ACO	6236	00132031	30 November 2025	93.9	93.9
ACO-R12	ACO	6236	00172040	30 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by : Adul Dangklom
 (Mr. Adul Dangklom)

Approved by : 
 (Mr. Peera Detudom)

คุณภาพอากาศในสถานประกอบการ



right solutions.
right partner.

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_FS0742	2-Jul-25	2-Oct-25	3
		Air Sampling Pump	RYG_FS0501	6-Jul-25	6-Oct-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

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

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 : 21 January 2025
Calibration Date : 27 January 2025

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

REVIEW BY Supt S.
APPROVED BY [Signature]
NEXT CAL DATE.....26/ 01/ 26.....

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 %.

Calibration By : [Signature]
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : [Signature]
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 27 January 2025



Certificate No : 25-AFM-023

Request No : Req-2025-0169

Result of Calibration : Without Adjustment

Temperature (^o 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 :

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

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 Aavailable, Customer does not require a statement of conformity.



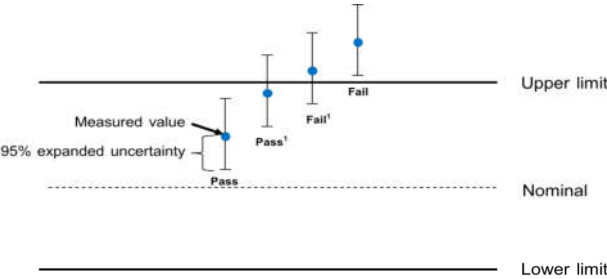
Certificate No : 25-AFM-023

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

Certificate No : 24-AFM-179

Name : ALS Laboratory Group Thailand Co., Ltd.

Request No : Req-2024-1987

Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : MesaLabs

Model : Defender 510-M

Serial Number : 151114

ID : BKK_FS0614

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

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

Instrument Status : Used

REVIEW BY *Manakorn P.*

APPROVED BY *[Signature]*

NEXT CAL. DATE *9/9/25*

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 %.

Calibration By : *[Signature]*
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : *[Signature]*
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 9 September 2024

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)

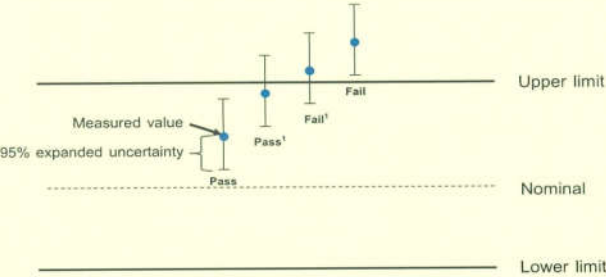
N/A = Not Aavailable, Customer does not require a statement of conformity.

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-020725-RYG_FS0742

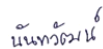
Air Sampling Pump Detail			
Equipment name	: Personal Air Sampling Pump	Equipment ID	: RYG_FS0742
Brand	: Gilian	Serial No.	: 20241110180
Model/Type	: GilAir Plus	Calibration Date	: 02-Jul-25
		Next calibration date	: 02-Oct-25

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	19.8	19.7	19.9	19.8	5%	19 - 21	Passed
50	48.9	49.7	49.1	49.2	5%	48 - 53	Passed
100	99.4	99.3	99.9	99.5	5%	95 - 105	Passed
200	199.2	199.6	199.4	199.4	5%	190 - 210	Passed
High Flow							
500	503.4	502.3	503.7	503.1	3%	485 - 515	Passed
1000	1009.7	1007.8	1006.1	1007.9	3%	970 - 1030	Passed
2000	2006.7	1999.2	2000.4	2002.1	3%	1940 - 2060	Passed
2500	2511.4	2507.5	2509.9	2509.6	3%	2425 - 2575	Passed

-----END OF REPORT-----

Calibrated By: 
(Mr. Nantawat Sarin)
RYG Field Services Scientist (1)
Issue date : 03-Jul-25

Approved By: 
(Mr. Supot Salamteh)
Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0501

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0501
Serial No. : 20201110101
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
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	19.8	20.5	20.2	5%	19 - 21	Passed
50	50.2	52.1	49.8	50.7	5%	48 - 53	Passed
100	98.5	101.8	99.2	99.8	5%	95 - 105	Passed
200	199.8	202.2	200.5	200.8	5%	190 - 210	Passed
High Flow							
500	498.7	500.4	499.9	499.7	3%	485 - 515	Passed
1000	999.8	1001.5	999.5	1000.3	3%	970 - 1030	Passed
2000	1998.8	2001.3	1997.7	1999.3	3%	1940 - 2060	Passed
2500	2502.5	2498.7	2512.9	2504.7	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: นพชาภ

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By: สุพจน์

(Mr. Suport Salamteh)

Field Services Section Head

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-3
Organization Name: ALS Laboratory Group
Organization Location: 104 Phatthanakan40, 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

Date: October 25, 2024 12:05:35 PM

System ID: GM-3

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:

RFPA Voltage:

11 mV

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

FrontSSL / ExternalSQ

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

FrontSSL / ExternalSQ

Name:5975C inert XL with TAD

Source:EI - InertFilament:1

Setpoint Status:Pass

Signal to Noise:1572

Agilent Recommended:>= 320

Source:EI - InertFilament:2

Setpoint Status:Pass

Signal to Noise:1541

Agilent Recommended:>= 320

Overall Signal to Noise EI Test Status

Pass

Injection Precision

Tested Combination1

FrontSSL / ExternalSQ

Name:7693A

Source:EI - Inert

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

FrontSSL / ExternalSQ

Injection Tower

Name:7693A

Source:EI - Inert

Setpoint Status:Pass

Injection Volume on Column:1.0 uL

Area Mass 1

Abundance*s0.61 %

Agilent Recommended:<= 5.00

Pass

Mass Ratio

0.33 %

<= 5.00

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

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

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

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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 10:33:46 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: 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 10:45:22 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

Page 2 / 11

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 10:47:22 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

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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 10:57:25 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\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			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 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\GCMS\1\data\OQPV2024\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;]

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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

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 11:28:50 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 \OQPV2024\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 \OQPV2024\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 \OQPV2024\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 \OQPV2024\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 \OQPV2024\MRP_006.D

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User Name: adirok.rattanawijitSystem Id: GM-3
Report Generated by Hostname: ASBKWX314Print 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\GCMS\1\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\GCMS\1\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\GCMS\1\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\GCMS\1\data \OQPV2024\MRP_004.D

User Name: adirok.rattanawijitSystem Id: GM-3
Report Generated by Hostname: ASBKWX314Print 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 \OQPV2024\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 \OQPV2024\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 \OQPV2024\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

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 11:44:32 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\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

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 11:45:59 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	10-Sep-25	9-Sep-26	12
		Air Sampling Pump	RYG_FS0508	3-Oct-25	3-Jan-26	3
		Air Sampling Pump	RYG_FS0743	2-Oct-25	2-Jan-26	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

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

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 : 21 January 2025
Calibration Date : 27 January 2025

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

REVIEW BY Supt S.
APPROVED BY [Signature]
NEXT CAL DATE.....26/ 01/ 26.....

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 %.

Calibration By : [Signature]
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : [Signature]
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 27 January 2025



Certificate No : 25-AFM-023
Request No : Req-2025-0169

Result of Calibration : Without Adjustment

Temperature (^o 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 :

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

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 Aavailable, Customer does not require a statement of conformity.

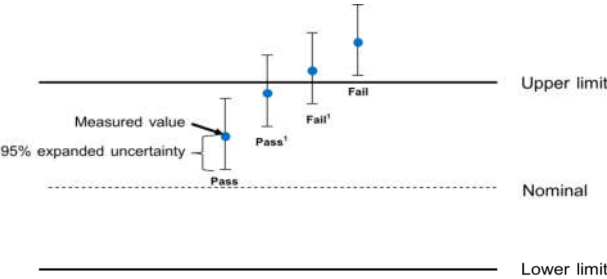


Certificate No : 25-AFM-023
Request No : Req-2025-0169

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 : 25-AFM-208

Request No : Req-2025-1986

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mesa Labs
Model : 200-510M
Serial Number : 151114
ID : BKK_FS0614

Sensor Model : -
Sensor Serial Number : -
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 : 3 September 2025
Calibration Date : 10 September 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	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	6 May 2026
Temperature meter	GT 11	08000057	Qreborn	15 October 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 and MIT NSC-TISI-TIS Accreditation No. 0052

Note :

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

Calibration By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 10 September 2025

Certificate No : 25-AFM-208

Request No : Req-2025-1986

Result of Calibration : Without Adjustment

STD Reading			UUC Readingg			Error (cc/min)	Uncertainty		
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)		(cc/min)	(°C)	(kPa)
25.5	100.98	100	-	-	100.02	0.0	3.6	1.0	0.50
25.7	100.97	503	-	-	500.81	-2.2	9.5	1.0	0.50
25.8	100.89	1003	-	-	1000.4	-3	19	1.0	0.50
26.1	100.88	2000	-	-	2001.9	2	38	1.0	0.50
26.5	100.85	3014	-	-	3002.2	-12	57	1.0	0.50
26.7	100.81	4027	-	-	4000.9	-26	76	1.0	0.50
27.0	100.74	5048	-	-	5001.8	-46	95	1.0	0.50

Note

STD : Standard UUC : Unit Under Calibration

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

- 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

Certificate No. C-031025-RYG_FS0508

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0508
Serial No. : 20201110106
Calibration Date : 03-Oct-25
Next calibration date : 03-Jan-26

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-25
Due Date : 9-Sep-26

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	19.6	19.6	19.6	19.6	5%	19 - 21	Passed
50	51.1	51.1	51.5	51.2	5%	48 - 53	Passed
100	100.3	100.1	100.2	100.2	5%	95 - 105	Passed
200	198.6	201.2	200.8	200.2	5%	190 - 210	Passed
High Flow							
500	503.4	505.7	503.1	504.1	3%	485 - 515	Passed
1000	1002.5	1004.2	1003.9	1003.5	3%	970 - 1030	Passed
2000	2011.6	2012.2	2016.5	2013.4	3%	1940 - 2060	Passed
2500	2506.2	2508.7	2512.6	2509.2	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 04-Oct-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-021025-RYG_FS0743

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0743
Serial No. : 20241110181
Calibration Date : 02-Oct-25
Next calibration date : 02-Jan-26

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 10-Sep-25
Due Date : 09-Sep-26

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	20.0	20.6	20.1	20.2	5%	19 - 21	Passed
50	50.5	50.6	50.5	50.5	5%	48 - 53	Passed
100	100.9	101.4	100.6	101.0	5%	95 - 105	Passed
200	200.8	201.0	200.9	200.9	5%	190 - 210	Passed
High Flow							
500	502.3	502.9	504.2	503.1	3%	485 - 515	Passed
1000	1007.0	1001.1	1002.6	1003.6	3%	970 - 1030	Passed
2000	2002.4	2003.3	2001.6	2002.4	3%	1940 - 2060	Passed
2500	2503.3	2502.0	2501.7	2502.3	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 03-Oct-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head

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

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

Log Amp

Tested Combination1FrontSSL/ ExternalSQ

Name:5975C inert XL with TAD

Setpoint Status:Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1FrontSSL/ ExternalSQ

Name:5975C inert XL with TAD

Setpoint Status:Pass

Amu:1050 m/z

Drift After Five Minutes:

RFPA Voltage:

11 mV

524 mV

Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1FrontSSL/ ExternalSQ

Name:5975C inert XL with TAD

Setpoint Status:Pass

Filament:1

Setpoint Status:Pass

Filament:2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1FrontSSL/ ExternalSQ

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 Combination1FrontSSL/ ExternalSQ

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 Combination1FrontSSL/ ExternalSQ

Name:7693A

Source:EI - Inert

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 Abundance*s 0.61 %

Mass Ratio 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 (uL) 10

Mainframe 1

Manufacturer Agilent Technologies

Name 7890

Model Number G3440A

Serial Number CN12521119

Firmware Revision A.01.14

Oven Type Standard

Inlet 1	
Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes
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/GoMs/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

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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

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 10:47:22 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

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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 10:57:25 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 10:58:48 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\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			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 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\GCMS\1\data\10QPV2024\ISN_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;]

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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 11:04:50 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 \OQPV2024\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 \OQPV2024\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 \OQPV2024\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 \OQPV2024\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 \OQPV2024\MRP_006.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 11:29:37 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 \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\GCMS\1\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\GCMS\1\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\GCMS\1\data \OQPV2024\MRP_004.D

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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 11:30:04 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 \OQPV2024\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 \OQPV2024\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 \OQPV2024\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

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 11:44:32 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 \OQPV2024\ISN_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

User Name: adirek.rattanawijitSystem Id: GM-3
Report Generated by Hostname: ASBKXWX314Print 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 ± 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 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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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.BLMTC.002 Rev.5

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Changwat Samutprakan 10280, Thailand
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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 20μPa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone 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	±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	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Signature)
.....
(Mr.Weerachai Deechaiyae)

Approved by :

(Signature)
.....
(Mr.Prawate Kluaypa)
Director

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

Noise R_644/25

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-B29	ACO	6236	00182011	11 November 2025	93.9	93.9
ACO-R51	ACO	6236	00192063	11 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

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 ± 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 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

1 / 2

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FM.BLMTC.002 Rev.5

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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 20μPa at 1000 Hz

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

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Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
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3. Total Distortion

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Note : 1. No adjustment.

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Calibrated by :

(Signature)
.....
(Mr.Weerachai Deechaiyae)

Approved by :

(Signature)
.....
(Mr.Prawate Kluaypa)
Director

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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Noise R_644/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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		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-B29	ACO	6236	00182011	11 November 2025	93.9	93.9
ACO-R51	ACO	6236	00192063	11 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)