ภาคผนวก 7-1

สำเนา ใบสอบเทียบเครื่องมือตรวจวัดและวิเคราะห์

Industrial Health Association of Asia
สมาคมสุขศาสตร์อุตสาหกรรมแห่งเอเชีย

PM10 Sampler Calibration

SITE

Project:High Volume Sampler Calibration
Location:Life & Environment Co.,Ltd
Date of calibration: Febuary 28,2025

DETAIL OF SAMPLER

Sampler Model:TE-6070 PM-10
Motor Model: TISCH
Motor Serail No,: 2095

CONDITIONS

Pressure of Ambient Air (Pa) (mm Hg):	759
Tempurerature of Ambient Air (Ta) (K):	304
Average Pressure (Ps) (mm Hg):	758
Average Temperature (Ts) (K):	301

CALIBRATION ORIFICE

Make : Tisch
Model : TE-5025A
Serial#: 5

Slope : 1.26202
Intercept: -0.01176

CALIBRATION

Plate or Test #	H_2O (in)	Qa (m^3/min)	I (chart)	IC (corrected)
1	11.60	1.717	58.0	36.71
2	9.40	1.547	54.0	34.18
3	7.20	1.355	48.0	30.38
4	4.60	1.085	41.0	25.95
5	2.70	0.833	36.0	22.78

LINEAR REGRESSION

Slope = 16.1192
Intercept = 8.9232
Corr. coeff.= 0.9975
SFR = 1.140
SSP = 37.75

# of Observations: 5

Calibrated by: [redacted]

Approved by : [redacted]
Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662) 3200277-8

Industrial Health Association of Asia
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PM10 Sampler Calibration

SITE

Project:High Volume Sampler Calibration
Location:Life & Environment Co.,Ltd
Date of calibration : Febuary 28,2025

DETAIL OF SAMPLER

Sampler Model:TE-6070 PM-10
Motor Model: TISCH
Motor Serail No,: 2182

CONDITIONS

Pressure of Ambient Air (Pa) (mm Hg):	759
Tempurerature of Ambient Air (Ta) (K):	304
Average Pressure (Ps) (mm Hg):	758
Average Temperature (Ts) (K):	301

CALIBRATION ORIFICE

Make : Tisch
Model : TE-5025A
Serial#: 5

Slope : 1.26202
Intercept: -0.01176

CALIBRATION

Plate or Test #	H_2O (in)	Qa (m^3/min)	I (chart)	IC (corrected)
1	11.20	1.688	60.0	37.97
2	9.00	1.514	55.0	34.81
3	7.00	1.336	50.0	31.64
4	4.40	1.061	40.0	25.31
5	2.70	0.833	34.0	21.52

LINEAR REGRESSION

Slope = 19.6807
Intercept = 4.9341
Corr. coeff.= 0.9986
SFR = 1.140
SSP = 37.75

# of Observations: 5

Calibrated by: [redacted]

Approved by : [redacted]
Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662) 3200277-8

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PM10 Sampler Calibration

SITE

Project:High Volume Sampler Calibration
Location:Life & Environment Co.,Ltd
Date of calibration : Febuary 28,2025

DETAIL OF SAMPLER

Sampler Model:TE-6070 PM-10
Motor Model: TISCH
Motor Serail No,: 2184

CONDITIONS

Pressure of Ambient Air (Pa) (mm Hg):	759
Tempurerature of Ambient Air (Ta) (K):	304
Average Pressure (Ps) (mm Hg):	758
Average Temperature (Ts) (K):	301

CALIBRATION ORIFICE

Make : Tisch
Model : TE-5025A
Serial#: 5

Slope : 1.26202
Intercept: -0.01176

CALIBRATION

Plate or Test #	H_2O (in)	Qa (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.30	1.695	54.0	34.18	Slope = 16.0974
2	9.10	1.522	50.0	31.64	Intercept = 7.1762
3	7.00	1.336	46.0	29.11	Corr. coeff.= 0.9982
4	4.50	1.073	39.0	24.68	SFR = 1.140
5	2.70	0.833	32.0	20.25	SSP = 37.75

# of Observations: 5

Calibrated by: [redacted]

Approved by : [redacted]
Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662) 3200277-8

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UKAS MANAGEMENT SYSTEMS

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** 038556 **Model :** 224-PC X R8

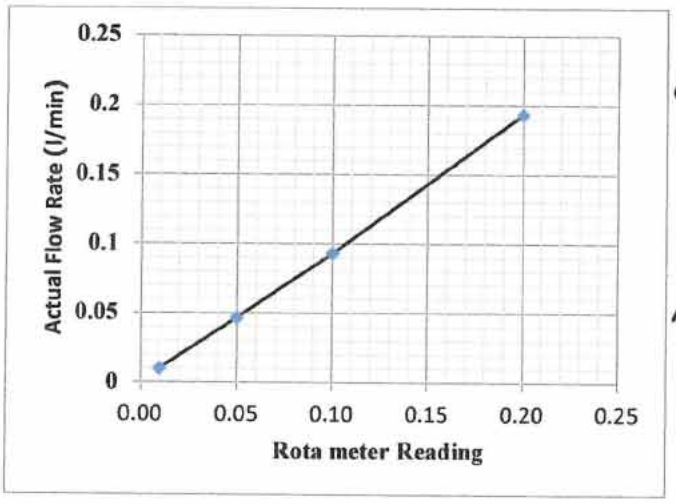
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-16

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.04	0.05	0.05	0.047	0.0058	±0.10	Pass
0.10	0.09	0.10	0.09	0.093	0.0058	±0.15	Pass
0.20	0.19	0.19	0.20	0.193	0.0058	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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UKAS MANAGEMENT SYSTEMS 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** 038545 **Model :** 224-PC X R8

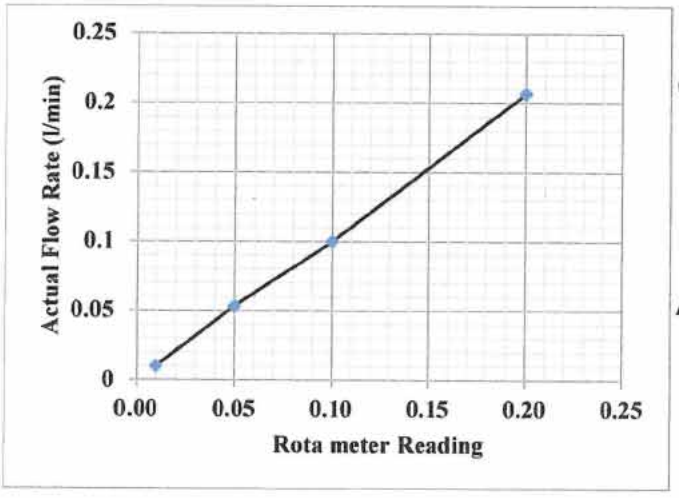
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-17

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter	Ambient Condition
SKC Model1355EZ30 S/N 0107070345011/003	Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.06	0.06	0.04	0.053	0.0115	±0.10	Pass
0.10	0.11	0.10	0.09	0.100	0.0100	±0.15	Pass
0.20	0.20	0.21	0.21	0.207	0.0058	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** A122571 **Model :** 224-PC X R8

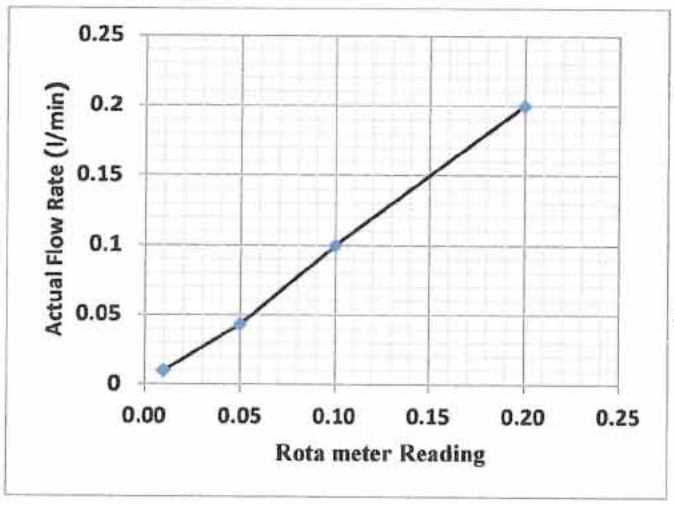
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-19

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.04	0.05	0.04	0.043	0.0058	±0.10	Pass
0.10	0.10	0.10	0.10	0.100	0.0000	±0.15	Pass
0.20	0.19	0.20	0.21	0.200	0.0100	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** A122840 **Model :** 224-PC X R8

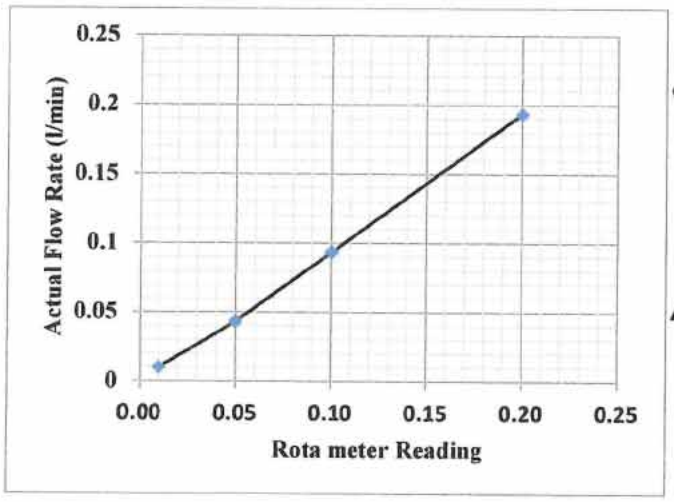
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-20

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.04	0.04	0.05	0.043	0.0058	±0.10	Pass
0.10	0.09	0.10	0.09	0.093	0.0058	±0.15	Pass
0.20	0.19	0.20	0.19	0.193	0.0058	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** 20150601076 **Model :** BDX-II

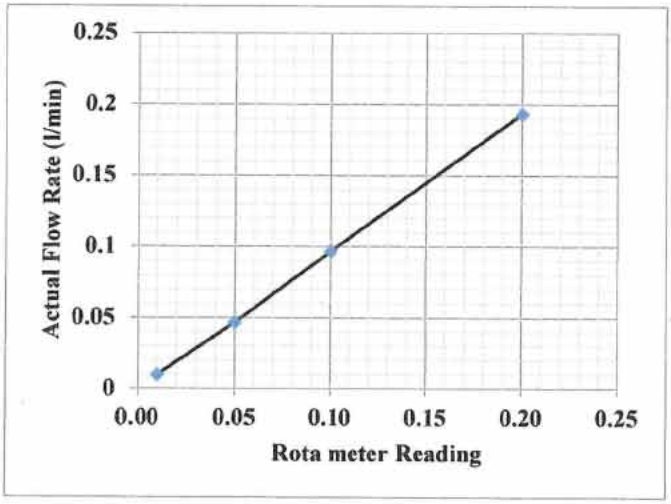
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-01

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter	Ambient Condition
SKC Model1355EZ30 S/N 0107070345011/003	Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.05	0.05	0.04	0.047	0.0058	±0.10	Pass
0.10	0.09	0.10	0.10	0.097	0.0058	±0.15	Pass
0.20	0.20	0.19	0.19	0.193	0.0058	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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ISO 9001 CERTIFICATION Intertek 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** 20170104055 **Model :** BDX-II

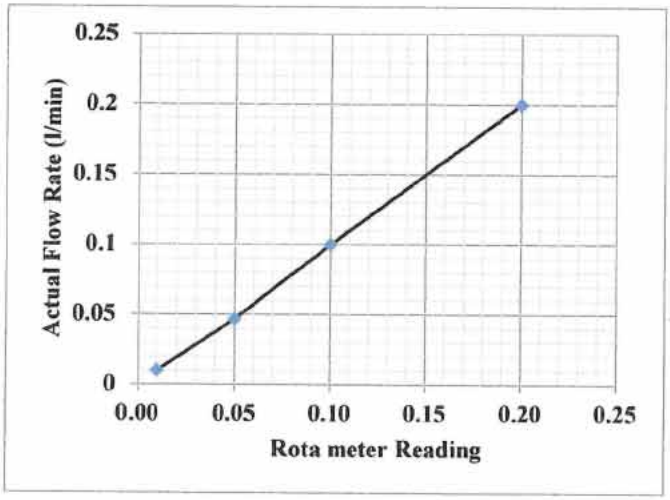
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-06

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter	Ambient Condition
SKC Model1355EZ30 S/N 0107070345011/003	Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.04	0.05	0.05	0.047	0.0058	±0.10	Pass
0.10	0.10	0.10	0.10	0.100	0.0000	±0.15	Pass
0.20	0.21	0.21	0.18	0.200	0.0173	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** 20170104061 **Model :** BDX-II

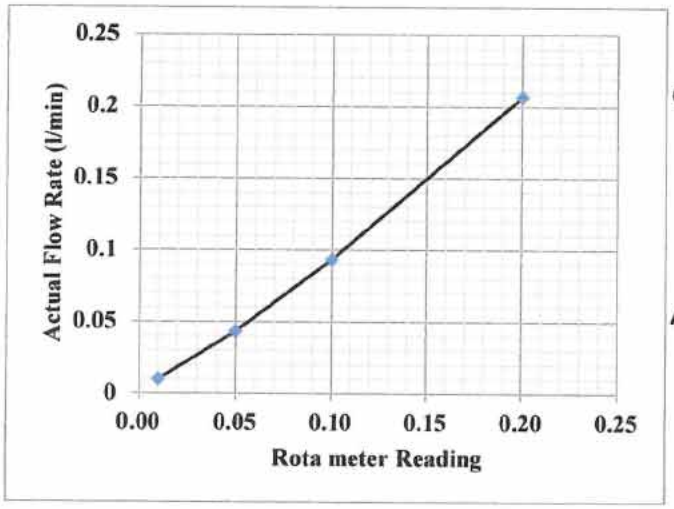
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-07

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter	Ambient Condition
SKC Model1355EZ30 S/N 0107070345011/003	Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.04	0.04	0.05	0.043	0.0058	±0.10	Pass
0.10	0.09	0.09	0.10	0.093	0.0058	±0.15	Pass
0.20	0.20	0.21	0.21	0.207	0.0058	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** 20170104062 **Model :** BDX-II

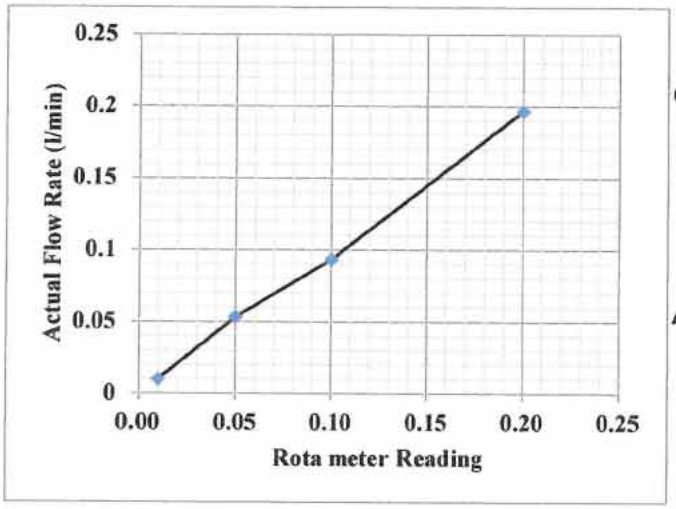
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-08

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.05	0.06	0.05	0.053	0.0058	±0.10	Pass
0.10	0.10	0.09	0.09	0.093	0.0058	±0.15	Pass
0.20	0.19	0.20	0.20	0.197	0.0058	±0.15	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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UKAS MANAGEMENT SYSTEMS 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** 20170104065 **Model :** BDX-II

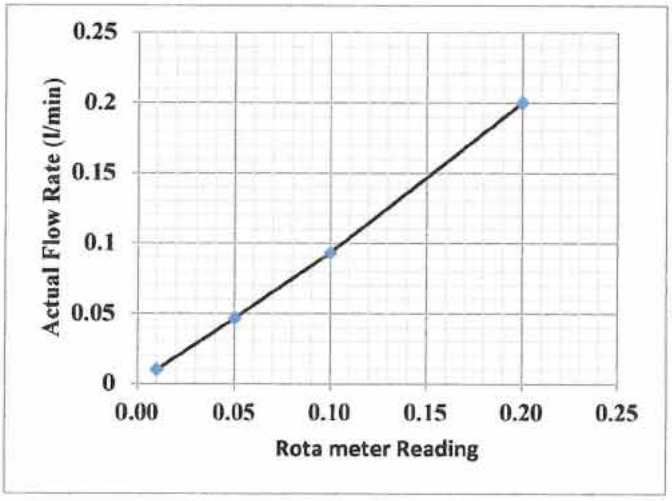
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-11

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter	Ambient Condition
SKC Model1355EZ30 S/N 0107070345011/003	Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.04	0.05	0.05	0.047	0.0058	±0.10	Pass
0.10	0.10	0.09	0.09	0.093	0.0058	±0.15	Pass
0.20	0.19	0.21	0.20	0.200	0.0100	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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UKAS 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(Low Flow)** **Serial No.** 20170104068 **Model :** BDX-II

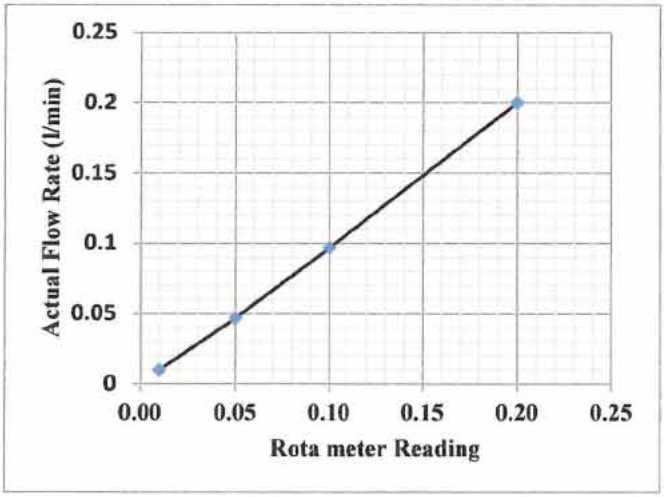
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-14

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.01	0.01	0.01	0.01	0.010	0.0000	±0.05	Pass
0.05	0.05	0.05	0.04	0.047	0.0058	±0.10	Pass
0.10	0.09	0.10	0.10	0.097	0.0058	±0.15	Pass
0.20	0.21	0.19	0.20	0.200	0.0100	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** 038556 **Model :** 224-PC X R8

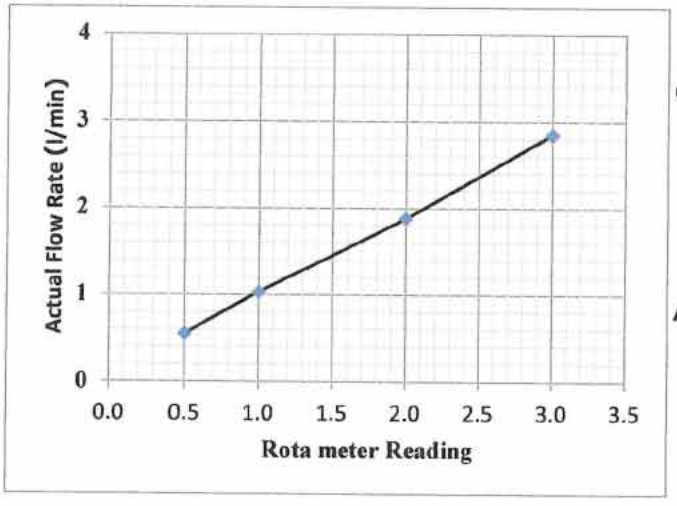
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-16

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.55	0.55	0.55	0.550	0.0000	±0.05	Pass
1.0	1.00	1.00	1.10	1.033	0.0577	±0.10	Pass
2.0	1.95	1.80	1.90	1.883	0.0764	±0.15	Pass
3.0	2.90	2.85	2.80	2.850	0.0500	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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ISO 9001 CERTIFICATION Intertek UKAS MANAGEMENT SYSTEM 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** 038545 **Model :** 224-PC X R8

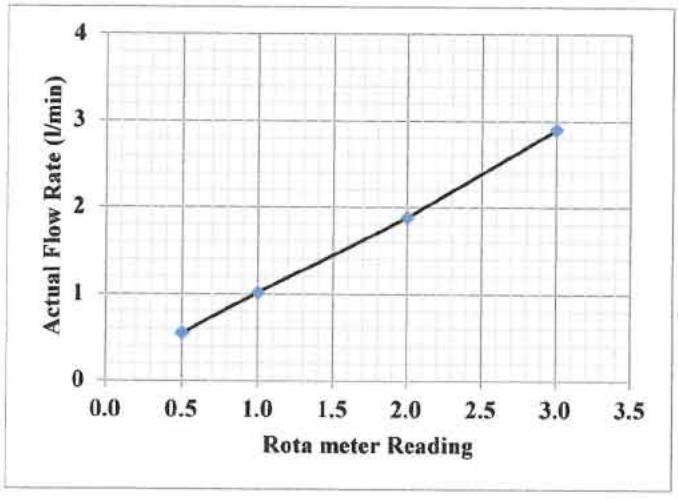
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-17

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.50	0.60	0.55	0.550	0.0500	±0.05	Pass
1.0	1.00	1.00	1.05	1.017	0.0289	±0.10	Pass
2.0	1.95	1.80	1.90	1.883	0.0764	±0.15	Pass
3.0	2.95	2.90	2.85	2.900	0.0500	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

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ISO 9001 CERTIFICATION Intertek
UKAS 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** A122571 **Model :** 224-PC X R8

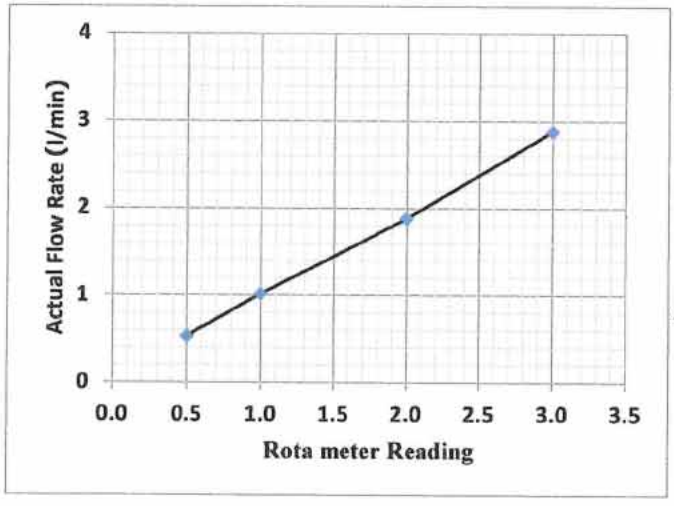
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-19

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.55	0.55	0.50	0.533	0.0289	±0.05	Pass
1.0	1.05	0.95	1.05	1.017	0.0577	±0.10	Pass
2.0	1.95	1.80	1.90	1.883	0.0764	±0.15	Pass
3.0	2.90	2.85	2.90	2.883	0.0289	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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ISO 9001 CERTIFICATION Intertek UKAS MANAGEMENT SYSTEMS 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** A122840 **Model :** 224-PC X R8

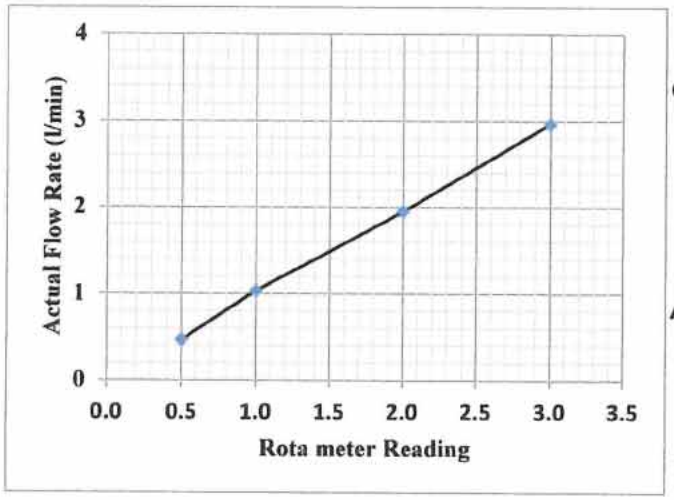
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-20

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.50	0.45	0.45	0.467	0.0289	±0.05	Pass
1.0	1.10	1.00	1.00	1.033	0.0577	±0.10	Pass
2.0	2.00	1.95	1.90	1.950	0.0500	±0.15	Pass
3.0	2.90	2.85	2.95	2.966	0.0500	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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ISO 9001 CERTIFICATION Intertek UKAS MANAGEMENT SYSTEMS 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** A122842 **Model :** 224-PC X R8

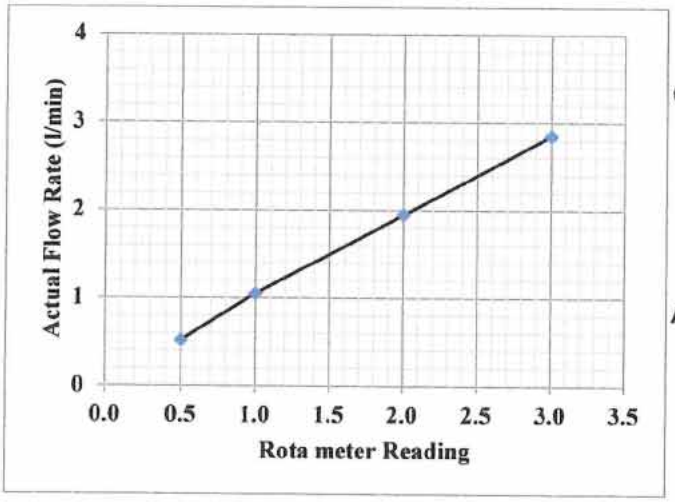
Manufacture : SKC (INC)

Date of Calibration : JANUARY 4, 2025 AM-21

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.50	0.50	0.55	0.517	0.0289	±0.05	Pass
1.0	1.00	1.05	1.10	1.050	0.0500	±0.10	Pass
2.0	1.90	1.90	2.05	1.950	0.0866	±0.15	Pass
3.0	2.95	2.80	2.80	2.850	0.0866	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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Intertek 014

CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** 20150601076 **Model :** BDX-II

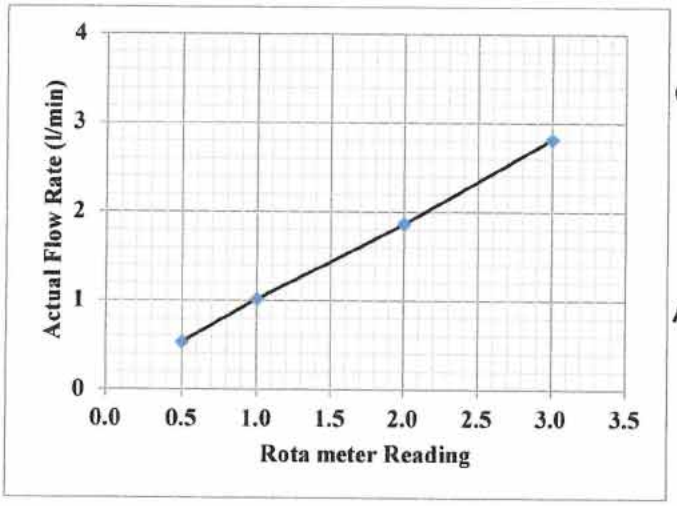
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-01

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.50	0.55	0.55	0.533	0.0289	±0.05	Pass
1.0	1.10	1.00	0.95	1.017	0.0764	±0.10	Pass
2.0	1.85	1.95	1.80	1.867	0.0764	±0.15	Pass
3.0	2.80	2.80	2.85	2.817	0.0289	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** 20170104055 **Model :** BDX-II

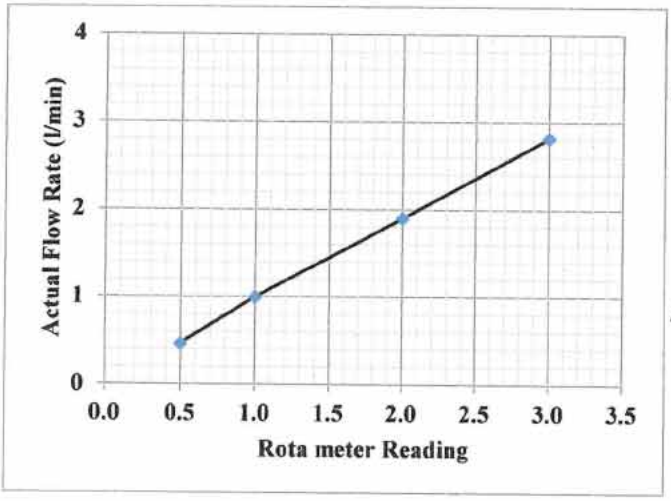
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-06

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.45	0.45	0.50	0.467	0.0289	±0.05	Pass
1.0	0.95	1.05	1.00	1.000	0.0500	±0.10	Pass
2.0	1.80	1.90	2.00	1.900	0.1000	±0.15	Pass
3.0	2.85	2.80	2.80	2.817	0.0289	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** 20170104061 **Model :** BDX-II

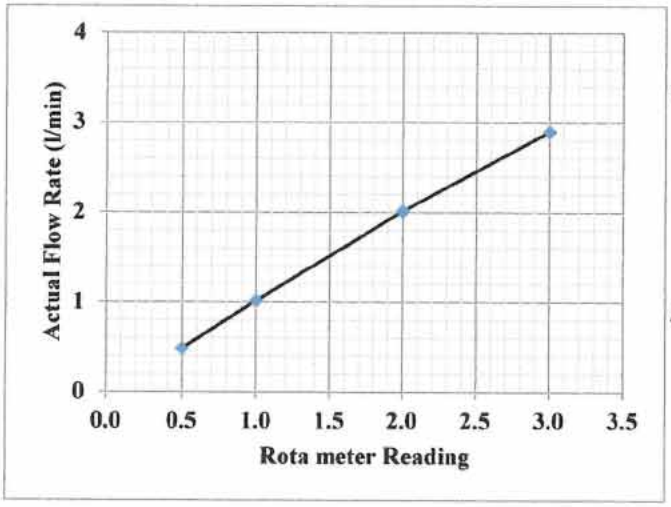
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-07

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.45	0.50	0.50	0.483	0.0289	±0.05	Pass
1.0	1.05	1.00	1.00	1.017	0.0289	±0.10	Pass
2.0	2.10	2.00	1.95	2.017	0.0764	±0.15	Pass
3.0	2.80	2.95	2.95	2.900	0.0866	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** 20170104062 **Model :** BDX-II

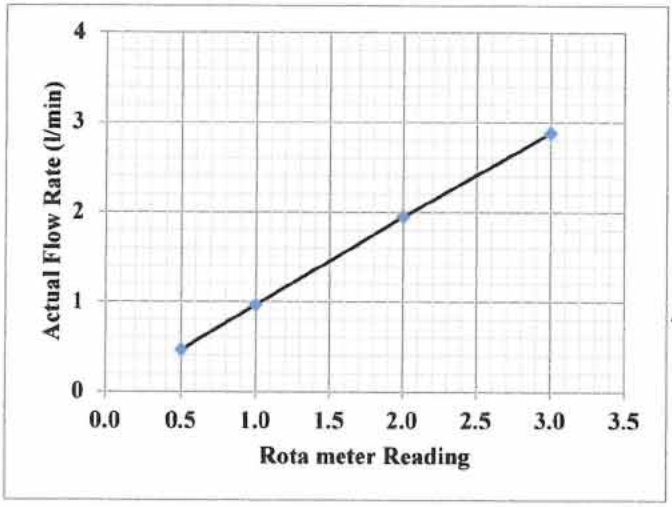
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-08

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.45	0.50	0.45	0.467	0.0289	±0.05	Pass
1.0	0.90	0.95	1.05	0.967	0.0764	±0.10	Pass
2.0	2.00	1.95	1.90	1.950	0.0500	±0.15	Pass
3.0	2.95	2.85	2.85	2.883	0.0577	±0.15	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** 20170104065 **Model :** BDX-II

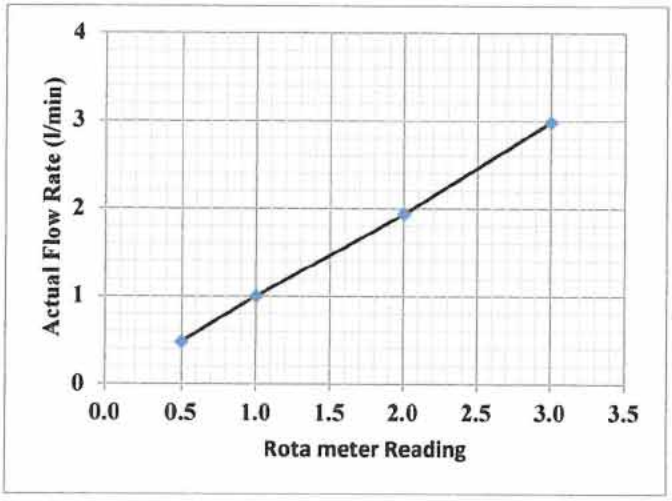
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-11

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.45	0.50	0.50	0.483	0.0289	±0.05	Pass
1.0	1.00	0.95	1.05	1.000	0.0500	±0.10	Pass
2.0	1.90	2.00	1.90	1.933	0.0577	±0.15	Pass
3.0	2.95	3.00	3.00	2.983	0.0289	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

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CALIBRATION TEST REPORT

Instrument : AIR CHECK SAMPLER **(High Flow)** **Serial No.** 20170104068 **Model :** BDX-II

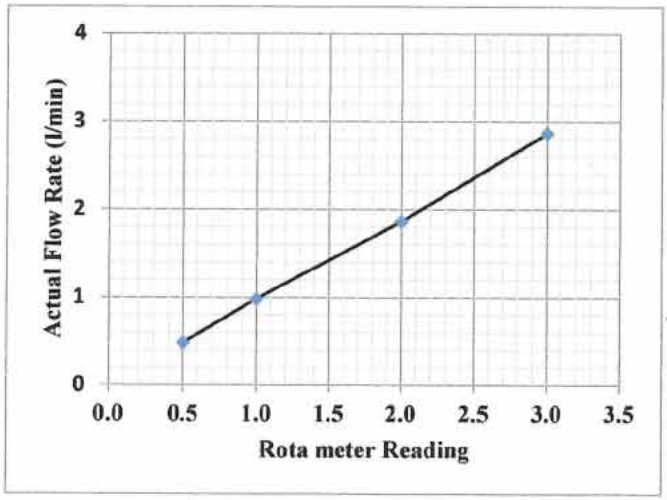
Manufacture : Gilian

Date of Calibration : JANUARY 4, 2025 GN-14

Next Time Calibration : JANUARY 4, 2026

Standard Criteria : Rota Meter SKC Model1355EZ30 S/N 0107070345011/003	Ambient Condition Temperature = 25.0 °C Pressure = 760 mmHg

Rota Meter Reading	Actual Flow Rate (l/min)				Deviation (l/min)	Permissible Deviation (l/min)	Status
	1	2	3	Average			
0.5	0.45	0.50	0.50	0.483	0.0289	±0.05	Pass
1.0	0.95	1.00	1.00	0.983	0.0289	±0.10	Pass
2.0	1.90	1.90	1.80	1.867	0.0577	±0.15	Pass
3.0	2.80	2.80	3.00	2.867	0.1155	±0.20	Pass



Calibrated by [redacted]

Approved by [redacted]

Industrial Hygiene Specialist

90,92,94 ซอยอ่อนนุช64 แขวงอ่อนนุช เขตสวนหลวง กรุงเทพฯ 10250 โทรศัพท์ (662)3200277-8

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24120388-1 Page : 1 of 3

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name : Rota Flow Meter
Manufacturer : Brooks Instrument Division
Model : 1355EZ30
Serial Number : 0107070345011/003
ID. Number : ROTA CAL.02

Environmental Conditions

Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 26 Dec 2024
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 03 Jan 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 03 Jan 2026
Calibration Procedure	: SP-CPM-04-13	Date of Issue	: 04 Jan 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrolcgy institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]
Calibration Officer

Approved by : [redacted]
Authorized Signatory

Calibration Report

Certificate Number : SPR24120388-1

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Standard Air Flow Meter	250 SLPM	260529	L0-1508003/24	20 Aug 2025

Traceability

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

THC - Thai Heart Calibration Co.,Ltd.

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR24120388-1

Range : 0 to 5 L/Min

Function : Air Flow Measurement

Unit : L/Min

Calibration Point	UUC Reading	Standard Reading	UUC Error	K Factor Value	Uncertainty (±)
0.02	0.02	0.03429	-0.01429	1.714500	0.058
0.10	0.1	0.04885	0.05115	0.488500	0.058
1.00	1.0	0.9726	0.0274	0.972600	0.059
2.00	2.0	2.0039	-0.0039	1.001950	0.061
3.00	3.0	3.0320	-0.0320	1.010667	0.065
4.00	4.0	4.0290	-0.0290	1.007250	0.070

Note:

The result of calibration was found accurate as show on date and place of calibration only.

This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95 %

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th

PREVENTIVE MAINTENANCE/ CALIBRATION

GC SYSTEM

GC-14B/C-R5A

ID NO.	:-
REPORT NO.	:C-A3-TK-6711-0257
DATE OF REPORT	:13 November 2024
COMPLETION DATE	:13 November 2024
NEXT DUE DATE	:ON November 2025

GAS CHROMATOGRAPHY

SERIAL NUMBER	C10733000756SA
CUSTOMER	LIFE AND ENVIRONMENT CO., LTD.
ADDRESS	90,92,94 SOI ON-NUCH 64, SRINAKARIN ROAD, ON-NUCH SUANLUANG, BANGKOK 10250.
ATTENTION	KHUN TUNYALUCK KREEPANICH
PHONE	02-320-0277-8 EXT.304,308
FAX	023200293
DONE BY	Mr.Nattapon Ngamsang
SERVICE REPORT NO.	C-A3-TK-6711-0257

SIGNED FOR AND ON BEHALF OF
BARA SCIENTIFIC CO.,LTD.

[redacted]

อนุมัติใช้วันที่ 3 มีนาคม 2553

TOLTAL NUMBER OF PAGES: 28

บริษัท พาราไซแอนติฟิค จำกัด
BARA SCIENTIFIC CO., LTD.

CERTIFICATE

THIS CERTIFIES THE PERFORMANCE OF SHIMADZU GAS CHROMATOGRAPHY AT

LIFE AND ENVIROMENT CO., LTD.ADDRESS : 90,92,94 SOI ON-NUCH 64, SRINAKARIN ROAD,SUANLUANG, BANGKOK 10250.

SYSTEM CONFIGURATION : GC-14B, C-R5A

DETECTOR TYPE : FLAME IONIZATION DETECTOR (FID)

METHOD : SENSITIVITY TEST OF FID BY SHIMADZU CORPORATION, JAPAN.

CHEMICAL : N-HEXADECANE(C_{16}) 100ng/uL (HEPTANE SOVENT)

SPECIFICATION OF FID :S(C/g)OF C16 IS MORE THAN 0.01(C/g)

RESULT : SENSITIVITY OF FID CH1 = **0.0115** C/g

REPRODUCIBILITY : Area Value CH1 CV $\leq$ 10.00 % = **3.079 %**

Retention Time CH1 CV $\leq$ 2.00 % = **0.363 %**

ISSUED ON : 13 November 2024

ISSUED AT : SERVICE SECTION, BARASCIENTIFIC CO.,LTD.

APPROVED BY :

([redacted])

SERVICE ENGINEER

PREVENTIVE MAINTENANCE/ CALIBRATION

GC SYSTEM

GC-14B/C-R5A

ID NO.	:-
REPORT NO.	:C-A3-TK-6811-0211
DATE OF REPORT	:12 November 2025
COMPLETION DATE	:12 November 2025
NEXT DUE DATE	:ON November 2026

GAS CHROMATOGRAPHY

SERIAL NUMBER	C10733000756SA
CUSTOMER	LIFE AND ENVIRONMENT CO., LTD.
ADDRESS	90,92,94 SOI ON-NUCH 64, SRINAKARIN ROAD, ON-NUCH SUANLUANG, BANGKOK 10250.
ATTENTION	KHUN TUNYALUCK KREEPANICH
PHONE	02-320-0277-8 EXT.304,308
FAX	023200293
DONE BY	Mr.Nattapon Ngamsang
SERVICE REPORT NO.	C-A3-TK-6811-0211

SIGNED FOR AND ON BEHALF OF
BARA SCIENTIFIC CO.,LTD.

[redacted]

CERTIFICATE

THIS CERTIFIES THE PERFORMANCE OF SHIMADZU GAS CHROMATOGRAPHY AT

LIFE AND ENVIROMENT CO., LTD.ADDRESS : 90,92,94 SOI ON-NUCH 64, SRINAKARIN ROAD,SUANLUANG, BANGKOK 10250.

SYSTEM CONFIGURATION : GC-14B, C-R5A

DETECTOR TYPE : FLAME IONIZATION DETECTOR (FID)

METHOD : SENSITIVITY TEST OF FID BY SHIMADZU CORPORATION, JAPAN.

CHEMICAL : N-HEXADECANE(C_{16}) 100ng/uL (HEPTANE SOVENT)

SPECIFICATION OF FID :S(C/g)OF C16 IS MORE THAN 0.01(C/g)

RESULT : SENSITIVITY OF FID CH1 = **0.0138** C/g

REPRODUCIBILITY : Area Value CH1 CV $\leq$ 10.00 % = **0.822 %**

Retention Time CH1 CV $\leq$ 2.00 % = **0.135 %**

ISSUED ON : 12 November 2025

ISSUED AT : SERVICE SECTION, BARASCIENTIFIC CO.,LTD.

APPROVED BY :

[redacted]

SERVICE ENGINEER

DKSH

NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	SPECTROPHOTOMETER	Certificate No.:	C06250507
Manufacturer:	CECIL	Job No.:	WO-00097669
Model:	CE 1011	Issued Date:	10 December 2025
Serial No.:	920-252	Page:	1 of 2
ID No.:	-		
Condition of the item:	Normal		

Customer: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Environment Condition:						
	Temperature	25.2	°C	±	0.4	°C
	Relative Humidity	54.2	%	±	2.6	%

Calibration Place: LIFE & ENVIRONMENT CO., LTD. (Air Testing Laboratory)
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Calibration By: Mr.Atachai Ngamchanat

Calibration Date: 10 December 2025

The Method Used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04

Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 134632 and 134634

The standard for Photometric Certificate No. 134665

[redacted]
Person in charge

[redacted]
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 8 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.40	420.5	-2.10	0.13
447.20	450.2	-3.00	0.13
459.30	459.6	-0.30	0.13
537.00	539.2	-2.20	0.13
638.00	640.3	-2.30	0.13
585.56	589.5	-3.94	0.13

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5783	0.577	0.0013	0.0045
	0.7109	0.713	-0.0021	0.0045
	1.0114	1.014	-0.0026	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5620	0.559	0.0030	0.0045
	0.6993	0.697	0.0023	0.0045
	0.9948	0.991	0.0038	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5226	0.523	-0.0004	0.0045
	0.6607	0.661	-0.0003	0.0045
	0.9389	0.940	-0.0011	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5204	0.519	0.0014	0.0045
	0.6972	0.697	0.0002	0.0045
	0.9921	0.992	0.0001	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5541	0.553	0.0011	0.0045
	0.7726	0.765	0.0076	0.0045
	1.1014	1.090	0.0114	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5615	0.560	0.0015	0.0045
	0.7622	0.758	0.0042	0.0045
	1.0864	1.079	0.0074	0.0045

The End of Certificate

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

DKSH

NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	Electronic Balance	Certificate No.:	C01250921
Model:	LA130S-F	Issued Date:	20 March 2025
Serial No. (or ID.):	16908811 (EP-AB-01/47)	Job No.:	WO-00065146
Manufacturer:	Sartorius	Page:	1 of 2
Condition:	In condition		

Customer: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Environment Condition:

Temperature	22 °C	±	0.7 °C
Humidity	36 %RH	±	2.9 %RH

Calibration Place: LIFE & ENVIRONMENT CO., LTD. (Air (TSP/PM10) Testing Laboratory)
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Calibration By: Mr. Nirud Runggrud

Calibration Date: 20 March 2025

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02250102

[redacted]
Person in charge

[redacted]
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

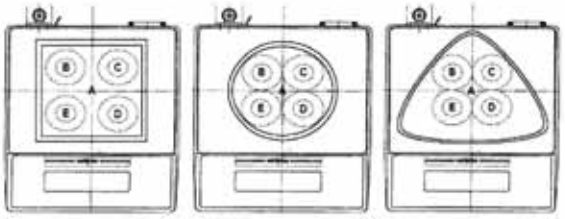
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.



Nominal Test Value 5 (g)

Reference Points (g)				
A	B	C	D	E
-	0.0004	-0.0004	-0.0001	-0.0002

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
1	0.00010
10	0.00011

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of indication (g)	Uncertainty (± g)	k
1	1.00000	1.0000	0.0000	0.00016	2.15
2	2.00001	2.0000	0.0000	0.00016	2.15
3	3.00001	3.0000	0.0000	0.00017	2.14
4	4.00003	4.0000	0.0000	0.00017	2.13
5	4.99998	5.0000	0.0000	0.00016	2.15
6	5.99998	5.9999	-0.0001	0.00017	2.13
7	6.99999	6.9999	-0.0001	0.00017	2.13
8	7.99999	8.0000	0.0000	0.00017	2.11
9	9.00001	9.0000	0.0000	0.00017	2.11
10	9.99999	10.0000	0.0000	0.00017	2.14

The End of Certificate

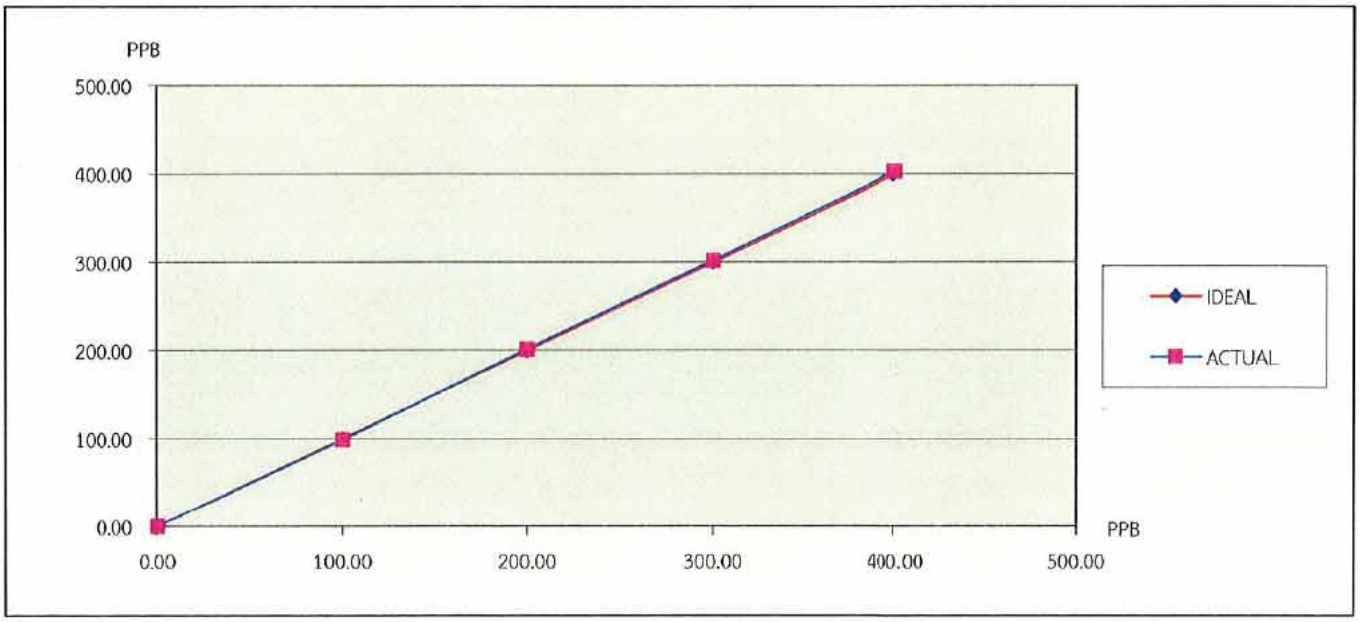
JNAC
JIRANATEE ASSOCIATES CO.,LTD.

TEST REPORT

CUSTOMER NAME	: All-Quip Co., Ltd. [บริษัท ออล ควิป จำกัด (สำนักงานใหญ่)]				
EQRIPMENT NAME	: SO_2 Analyzer				
MANUFACTURER	: HORIBA	MODEL :	APSA-370	SERIAL NO	: 4AXYPEYX
STANDARD GAS CONCENTRATION (PPM)	: 53.29 PPM			CYLINDER NO	: CC734373
CYLINDER PRESSURE (PSI)	: 1,400 PSI			CERTIFIED DATE	: 12/05/2020
CERTIFIED BY	: AIRGAS			EXPIRED DATE	: 12/05/2028

TEST RESULTS

POINT NO	TEST RESULTS			
	IDEAL	ACTUAL	ERROR	%ERROR
ZERO	0.00	0.01	0.01	-
1	100.00	98.70	-1.3	-1.30
2	200.00	201.30	1.3	0.65
3	300.00	301.70	1.7	0.57
4	400.00	402.90	2.9	0.72
AVERAGE (%)				0.16



CALIBRATED BY :..... [redacted] ..... DATE : 3/2/68

CHECKED BY :..... [redacted] ..... DATE : 3/2/68

JNAC JIRANATEE ASSOCIATES CO.,LTD.

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jiranatee.com

เลขที่ 63/14-15,67/35-36 ถนน ซอยเพชรเกษม 7,7/1 เพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

JNAC
JIRANATEE ASSOCIATES CO.,LTD

CHECK LIST

CUSTOMER NAME : All-Quip Co., Ltd. [บริษัท ออล ควิป จำกัด (สำนักงานใหญ่)]		
EQUIPMENT NAME : SO_2 Analyzer		
MANUFACTURER : HORIBA	MODEL : APSA-370	SERIAL NO. : 4AXYPEYX

TEST VALUES

NO.	Ambient SO_2 Monitor	UNIT	BEFORE	AFTER
1	SIGNAL	mV (Voltage of the measured SO_2 Value)	16.20	17.00
2	LAMP	mV (200mV to 1200 mV)	277.40	278.20
3	CELL	°C (Ambient tembient temperature +(5°C to 15°C))	32.00	33.30
4	PUMP	kPa (65 kPa or less)	41.80	42.00
5	AMBIENT	kPa	100.80	100.90
6	SAMPLE	L/min (0.6 L/min to 1.0 L/min)	-	-
7	DC 24 V	V (24 V ± 0.5 V)	23.90	23.90
8	DC 5 V	V (5 V ± 0.5 V)	5.00	5.00
9	SAMPLE SO2 Reading	PPB	0.10	2.60
10	Zero	PPB	1.00	0.01
11	Span	PPB	421.80	402.90

Remark : Reference EX-EN-019-56 , Ambient SO2 Monitor APSA-370 Operetion Manual Page #78
(Ambeint temperature = 5°C to 40°C)

อาการที่ตรวจพบ

-

รายละเอียดการดำเนินการ

- ทำ Calibration Zero/Span , Multipoint , เช็ค Dianostics

ผลการดำเนินการ

- เรียบร้อย เครื่องสามารถดำเนินการตรวจวัดได้ตามปกติ

CALIBRATED BY : [redacted] *DATE :* 3/2/68

CHECKED BY : [redacted] *DATE :* 3/2/68

JNAC JIRANATEE ASSOCIATES CO.,LTD.

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jiranatee.com

เลขที่ 63/14-15 , 67/35-36 ซอยเพชรเกษม 7,7/1 ถนนเพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร : 02-868-0812-13 โทรสาร : 02-868-1889

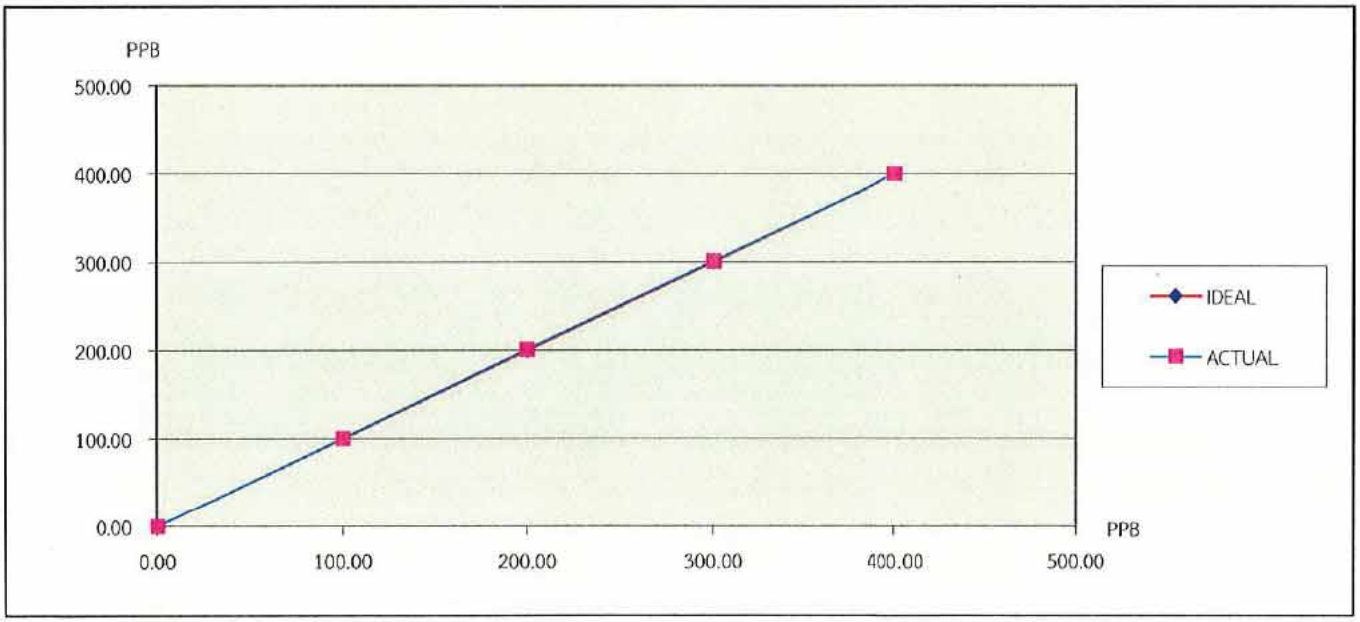
JNAC
JIRANATEE ASSOCIATES CO.,LTD.

TEST REPORT

CUSTOMER NAME	: All-Quip Co., Ltd. [บริษัท ออล ควิป จำกัด (สำนักงานใหญ่)]				
EQRIPMENT NAME	: SO_2 Analyzer				
MANUFACTURER	: HORIBA	MODEL :	APSA-370	SERIAL NO	: P333UH11
STANDARD GAS CONCENTRATION (PPM)	: 53.29 PPM			CYLINDER NO	: CC734373
CYLINDER PRESSURE (PSI)	: 1,400 PSI			CERTIFIED DATE	: 12/05/2020
CERTIFIED BY	: AIRGAS			EXPIRED DATE	: 12/05/2028

TEST RESULTS

POINT NO	TEST RESULTS			
	IDEAL	ACTUAL	ERROR	%ERROR
ZERO	0.00	0.00	0.00	-
1	100.00	100.10	0.1	0.10
2	200.00	201.00	1.0	0.50
3	300.00	300.40	0.4	0.13
4	400.00	399.90	-0.1	-0.03
AVERAGE (%)				0.18



CALIBRATED BY :..... [redacted] DATE : 4/2/68

CHECKED BY :..... [redacted] DATE : 4/2/68

JNAC JIRANATEE ASSOCIATES CO.,LTD.

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jiranatee.com

เลขที่ 63/14-15,67/35-36 ถนน ซอยเพชรเกษม 7,7/1 เพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

JNAC
JIRANATEE ASSOCIATES CO.,LTD.

CHECK LIST

CUSTOMER NAME : All-Quip Co., Ltd. [บริษัท ออล ควิป จำกัด (สำนักงานใหญ่)]		
EQUIPMENT NAME : SO_2 Analyzer		
MANUFACTURER : HORIBA	MODEL : APSA-370	SERIAL NO. : P333UH11

TEST VALUES

NO.	Ambient SO_2 Monitor	UNIT	BEFORE	AFTER
1	SIGNAL	mV (Voltage of the measured SO_2 Value)	5.60	6.00
2	LAMP	mV (200mV to 1200 mV)	238.50	238.60
3	CELL	°C (Ambient tembient temperature +(5°C to 15°C))	35.50	35.90
4	PUMP	kPa (65 kPa or less)	31.20	31.30
5	AMBIENT	kPa	101.60	101.40
6	SAMPLE	L/min (0.6 L/min to 1.0 L/min)	-	-
7	DC 24 V	V (24 V ± 0.5 V)	24.00	24.00
8	DC 5 V	V (5 V ± 0.5 V)	5.00	5.00
9	SAMPLE SO2 Reading	PPB	1.45	1.20
10	Zero	PPB	1.89	0.00
11	Span	PPB	343.12	399.90

Remark : Reference EX-EN-019-56 , Ambient SO2 Monitor APSA-370 Operetion Manual Page #78

(Ambeint temperature = 5°C to 40°C)

อาการที่ตรวจพบ

-

รายละเอียดการดำเนินการ

- ทำ Calibration Zero/Span , Multipoint , เช็ค Dianostics

ผลการดำเนินการ

- เรียบร้อย เครื่องสามารถดำเนินการตรวจวัดได้ตามปกติ

CALIBRATED BY : [redacted] *DATE :* 4/2/68

CHECKED BY : [redacted] *DATE :* 4/2/68

JNAC JIRANATEE ASSOCIATES CO.,LTD.

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jiranatee.com

เลขที่ 63/14-15 , 67/35-36 ซอยเพชรเกษม 7,7/1 ถนนเพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร : 02-868-0812-13 โทรสาร : 02-868-1889

SITHIPORN associates

Test Report Calibration

Ecotech EC9850 Sulphur Dioxide Analyzer

Issued By	Sithiporn Associates Company Limited	Calibration Date	17-Feb-2025
Owner Name	Life & Environment Co.,Ltd.	Product Brand	Ecotech
Certificate Number	SVO40655	Type Systematic	Analyzer Ambient Monitoring

Model :	EC9850	Serial Number :	02-0314

Calibration Standard equipment : Std. Gas Mixture Cylinder Number EB0152562 Expired Date 17-May-2025

Brand : Airgas

Components	Concentration
Carbon Monoxide (CO)	4504 PPM
Nitric Oxide (NO)	45.73 PPM
Sulfur Dioxide (SO_2)	45.67 PPM
Nitrogen (N_2)	Balance

Calibration Setting

Span Instrument Gain 26.634 Start Time 11:35

Reading (Before Adj.)			
Span Set Point	Expected Concentration (PPB)	Analyzer Response (PPB)	Error %
Zero	0	0	-
Span	400	400	0.00

Span Instrument Gain 34.613 Finish Time 12:10

Signature [redacted] Approved [redacted]

บริษัท สิทธิพรแอสโซซิเอส จำกัด
SITHIPORN ASSOCIATES COMPANY LIMITED

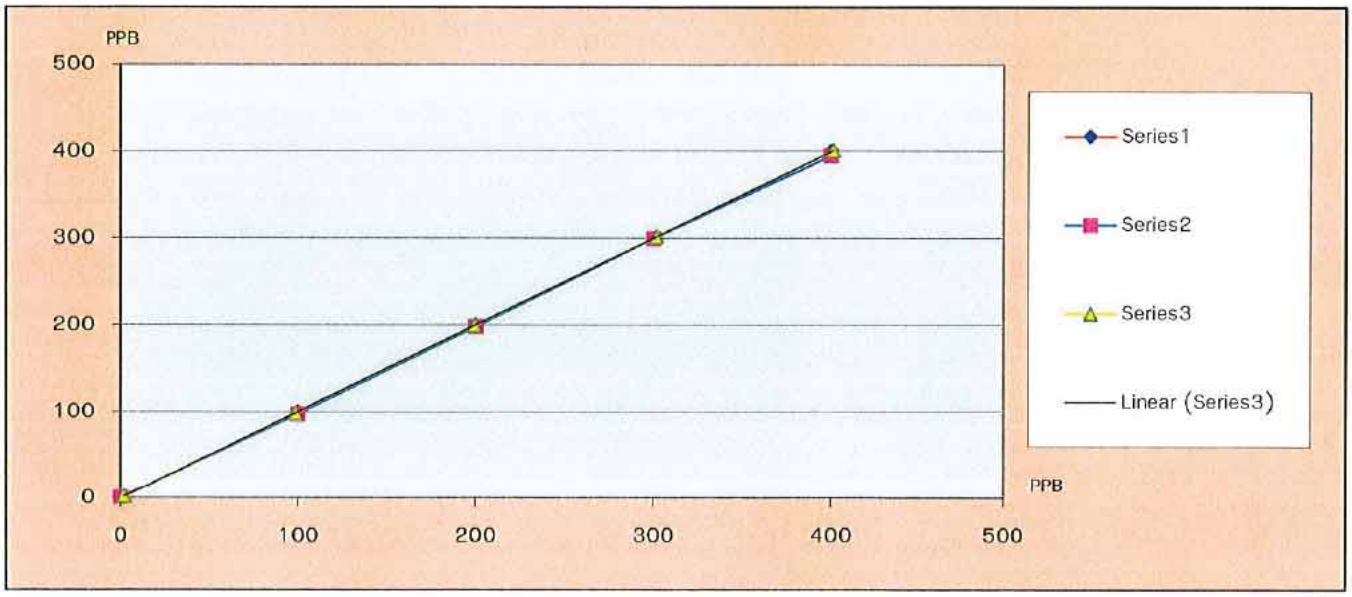
451-451/1 ถนนสิรินธร แขวงบางบำหรุ เขตบางพลัด กรุงเทพฯ 10700
451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok 10700, Thailand
Email : center@sithiphorn.com
Tel. +66 2433 8331 www.sithiphorn.com

TEST REPORT

CUSTOMER NAME	: All-Quip Co., Ltd. [บริษัท ออล ควิป จำกัด (สำนักงานใหญ่)]				
EQRIPMENT NAME	: NO_x Analyzer				
MANUFACTURER	: HORIBA	MODEL :	APNA-370	SERIAL NO	: XFJLIE36
STANDARD GAS CONCENTRATION (PPM) : 53.15 PPM				CYLINDER NO	: CC734373
CYLINDER PRESSURE (PSI) : 1,400 PSI				CERTIFIED DATE	: 12/05/2020
CERTIFIED BY : AIRGAS				EXPIRED DATE	: 12/05/2028

TEST RESULTS

POINT NO	TEST RESULTS						
	IDEAL	ACTUAL NO	ERROR NO	%ERROR NO	ACTUAL NO_x	ERROR NO_x	%ERROR NO_x
ZERO	0.00	0.10	0.10	-	0.20	0.20	-
1	100.00	100.10	0.10	0.10	101.30	1.30	1.30
2	200.00	200.80	0.80	0.40	201.70	1.70	0.85
3	300.00	301.70	1.70	0.57	300.50	0.50	0.17
4	400.00	399.30	-0.70	-0.17	400.10	0.10	0.03
AVERAGE (%)				0.22			0.59



CALIBRATED BY : [redacted] *DATE :* 11/2/68

CHECKED BY : *DATE* 11/2/68

JIRANATEE ASSOCIATES CO., LTD.

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15,16 , E-Mail : Engineer@jiranatee.com

เลขที่ 63/14-15,67/35-36 ซอยนนทบุรีเกษม 7,7/1 ถนนนนทบุรีเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

CHECK LIST

CUSTOMER NAME : All-Quip Co., Ltd. [บริษัท ออล ควิป จำกัด (สำนักงานใหญ่)]		
EQUIPMENT NAME : NO_x Analyzer		
MANUFACTURER : HORIBA	MODEL : APNA-370	SERIAL NO. : XFJLIE36

TEST VALUES

NO.	NO_x Analyzer (APNA-370)	UNIT	BEFORE	AFTER
1	Signal (NO)	mV	2.80	5.10
2	Signal (NO_x)	mV	8.90	8.70
3	Detector	Temp °C , Standard Value : Ambient temp+(5°Cto15°C)	41.10	41.10
		Pressure kPa , Standard Value : (Ambient/1013x100-20)±4kPa	77.80	77.70
4	AMBIENT	kPa	102.10	102.00
5	SAMPLE	L/min (1.1 L/min ± 0.3 L/min)	-	-
6	DC 24 V	V (24 V ± 0.5 V)	23.60	23.60
7	DC 5 V	V (5 V ± 0.5 V)	5.00	5.00
8	Samping NO Reading	PPB	12.10	9.50
9	Samping NO_2 Reading	PPB	36.30	18.10
10	Samping NO_x Reading	PPB	48.60	27.60
11	Zero (NO)	PPB	-0.20	0.10
12	Span(NO)	PPB	665.70	399.30
13	Zero (NO_x)	PPB	3.80	0.20
14	Span (NO_x)	PPB	666.10	400.10

Remark : Reference EX-EN-022-56 , "Ambient NO_x Monitor APNA-370 Operetion Manual " Page #48

(Ambient temperature = 5°C to 40°C)

อาการที่ตรวจพบ

-

รายละเอียดการดำเนินการ

- ทำ Calibration Zero/Span , Multipoint , เช็ค Dianostics

ผลการดำเนินการ

- เรียบร้อย เครื่องสามารถดำเนินการตรวจวัดได้ตามปกติ

CALIBRATED BY : [redacted] DATE : 11/2/68

CHECKED BY : JIRANATEE ASSOCIATES CO.,LTD. DATE : 11/2/68

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jiranatee.com

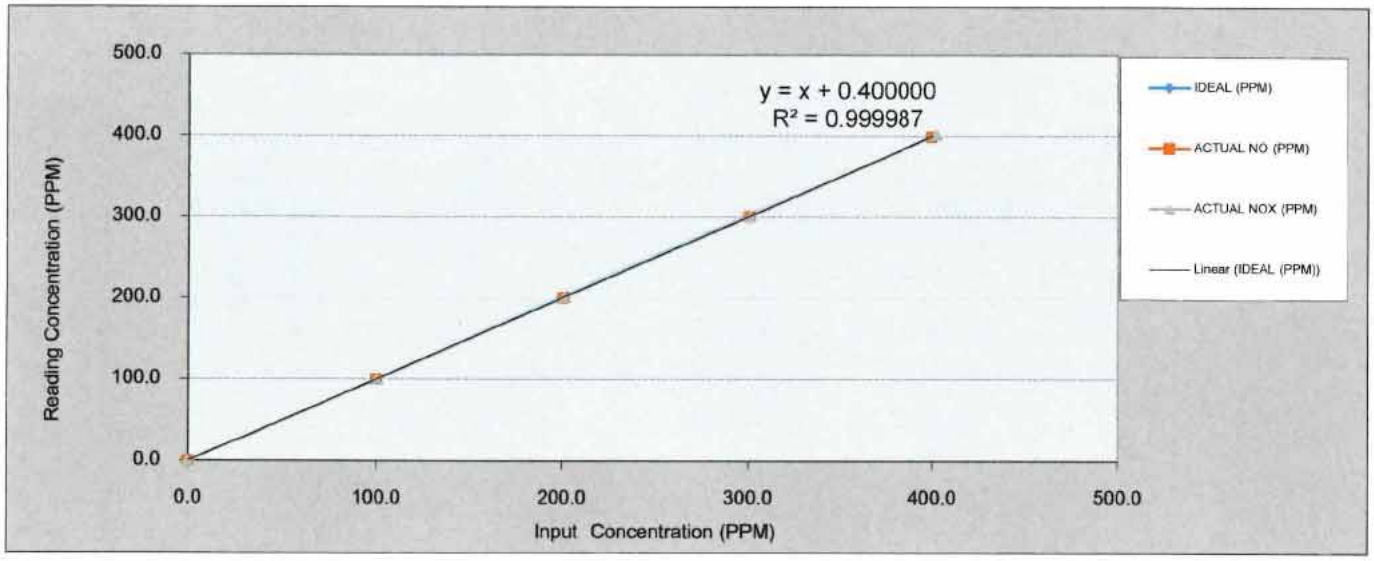
เลขที่ 63/14-15,67/35-36 ซอยเพชรเกษม 7,7/1 ถนนเพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : บริษัท ชีวิตและสิ่งแวดล้อม จำกัด		
EQUIPMENT NAME : NO_x Analyzer		
MANUFACTURER : Teledyne API	MODEL : 200EH	SERIAL NUMBER : 2288
STANDARD GAS CONCENTRATION (PPM) : 53.40		CYLINDER NO : CC745169
CYLINDER PRESSURE (PSIG) : 2015		CERTIFIED DATE : Mar 10, 2021
CERTIFIED BY : AIRGAS SPECIALTY GASES		EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPM)	ACTUAL NO (PPM)	ERROR NO (PPM)	% ERROR NO	ACTUAL NO_x (PPM	ERROR NO_x (PPM)	% ERROR NO_x
ZERO	0.0	0.1	0.1	-	0.1	0.1	-
1	100.0	100.2	0.2	0.2	100.6	0.6	0.6
2	200.0	201.0	1.0	0.5	201.7	1.7	0.8
3	300.0	301.0	1.0	0.3	301.5	1.5	0.5
4	400.0	399.7	-0.3	-0.1	402.0	2.0	0.5
AVERAGE (%)				0.3			0.6



CALIBRATED BY [redacted]	DATE : 24 กุมภาพันธ์ 2568
ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : [redacted]	

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : Info@kinetics.co.th

KINETICS
บริษัท ไคเนติคส์ คอร์ปอเรชัน จำกัด
KINETICS CORPORATION LTD.

ISO 9001 BUREAU VERITAS Certification

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : บริษัท ชีวิตและสิ่งแวดล้อม จำกัด
วันที่ : 24 กุมภาพันธ์ 2568
รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer
บริษัทผู้ผลิต : Teledyne API
รุ่นของอุปกรณ์ / เครื่องมือ : 200E
หมายเลขอุปกรณ์ / เครื่องมือ : 2288

TEST VALUES				
	API MODEL 200E		BEFORE	AFTER
1	RANGE	50 - 20,000 PPM	500.0	500
2	STABILITY	≤ 1 PPM	0.2	0.2
3	SAMPLE FLOW	500 ± 10% cc/min	488	490
4	OZONE FLOW	80 ± 10% cc/min	80	80
5	PMT	mV	88.7	92.9
6	NORM PMT	mV	5.6	28.2
7	A ZERO	-20 To 150 mV	63.6	53.6
8	HPVS	400 - 900 V	749	796
9	RX CELL TEMP	50 ± 1 °C	49.9	50
10	BOX TEMP	AMBIENT ± 5 °C	29.9	30.5
11	PMT TEMP	7 ± 2 °C	6.8	6.9
12	MOLY TEMP	315 ± 5 °C	316	316
13	RX CELL PRESSURE	< 10 in - Hg-A	1.2	1.2
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	29.5	29.6
15	NOX SLOPE	1.0 ± 0.3	1.131	1.090
16	NOX OFFSET	-50 To 150	14.2	10.8
17	NO SLOPE	1.0 ± 0.3	1.024	0.989
18	NO OFFSET	-50 To 150	1.1	0.8
19	NO SAMPLE READING	PPM	1.8	0.9
20	NO2 SAMPLE READING	PPM	2.0	4.9
21	NOX SAMPLE READING	PPM	3.8	5.6
22	OPTIC TEST	2000 ± 1000 mV	2347.5	2341.4
23	ELECTRICAL TEST	2000 ± 1000 mV	2476.9	2468.4
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.26 / 12.38 / 15.77 / -15.14	5.26 / 12.38 / 15.77 / -15.14
25	ZERO GAS NO / NOx	0.00 / 0.00 PPM	0.5 / -2.1	0.1 / 0.1
26	SPAN GAS NO / NOx	400.00 / 400.00 PPM	280.6 / 285.4	399.7 / 402.0

หมายเหตุ

- ทำการเปลี่ยน Filter ss 3 ชิ้น,Spring 3 ชิ้น,O-ring 6 ชิ้น
- Calibrate Multi-point

[redacted]

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : [redacted]
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 [redacted]

SITHIPORN associates

Test Report Calibration

Ecotech EC9841 Nitrogen Oxides Analyzer

Issued By	Sithiporn Associates Company Limited	**Calibration Date**	17-Feb-2025
Owner Name	Life & Environment Co.,Ltd.	**Product Brand**	Ecotech
Certificate Number	SVO40655	**Type Systematic**	Analyzer Ambient Monitoring

Model :	EC9841	**Serial Number :**	02-0409

Calibration Standard equipment : Std. Gas Mixture Cylinder Number EB0152562 Expired Date 17-May-2025

Brand : Airgas

Components	**Concentration**
Carbon Monoxide (CO)	4504 PPM
Nitric Oxide (NO)	45.73 PPM
Sulfur Dioxide (SO_2)	45.67 PPM
Nitrogen (N_2)	Balance

Calibration Setting

Span Instrument Gain 10.764 Start Time 10:35

Reading (After Adj.)			
Span Set Point	Expected Concentration (PPB)	Analyzer Response (PPB)	Error %
Zero NO	0	0	-
Zero NO_x	0	0	-
Span NO	400	399	-0.25
Span NO_x	400	400	0.00

Span Instrument Gain 17.566 Finish Time 11:10

Signature [redacted] Approved [redacted]

บริษัท สิทธิพรแอสโซซิเอส จำกัด

SITHIPORN ASSOCIATES COMPANY LIMITED

451-451/1 ถนนสิรินธร แขวงบางบำหรุ เขตบางพลัด กรุงเทพฯ 10700
451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok 10700, Thailand
Email : center@sithiphorn.com
Tel. +66 2433 8331 www.sithiphorn.com

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
6141 Easton Road
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer:	AIR LIQUIDE (THAILAND) LTD		
Part Number:	E04NI99E15A0292	Reference Number:	160-402702977-1
Cylinder Number:	CC757566	Cylinder Volume:	144.0 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12023	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Apr 18, 2023

Expiration Date: Apr 18, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	55.00 PPM	55.88 PPM	G1	+/- 1.4% NIST Traceable	04/11/2023, 04/18/2023
NITRIC OXIDE	55.00 PPM	55.87 PPM	G1	+/- 1.3% NIST Traceable	04/11/2023, 04/18/2023
SULFUR DIOXIDE	55.00 PPM	55.91 PPM	G1	+/- 1.0% NIST Traceable	04/11/2023, 04/18/2023
CARBON MONOXIDE	4500 PPM	4518 PPM	G1	+/- 0.7% NIST Traceable	04/11/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	210607-22	CC708067	48.41 PPM NITRIC OXIDE/NITROGEN	+/- 1.2%	Sep 21, 2025
PRM	12395	D887660	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 22, 2022
GMIS	DCK1201202230	CC750372	49.20 PPM NITRIC OXIDE/NITROGEN	+/- 0.9%	Jan 19, 2026
PRM	12404	APEX 1324257 - NOX	50.06 PPM NOx/NITROGEN	+/- 0.4%	Dec 22, 2023
GMIS	124206889104	CC322509	4.326 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 21, 2025
NTRM	160610-01	CC473196	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Mar 22, 2028
GMIS	07212022B109	EB0141209	50.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Dec 21, 2026
CARBON MONOXIDE	051608	KAL004632	4857 PPM CARBON MONOXIDE/NITROGEN	0.60%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Apr 05, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Apr 06, 2023
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Mar 23, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Apr 13, 2023

[redacted]
Approved for Release

SITHIPORN associates

Maintenance and Calibration Report

Wind Speed Sensor

Met One Instrument	Model: 034B	S/N. : Y1846
Date 26 February 2025		Start Time 14:30
Calibrator : Metone	Model: 053-220	S/N.: W15225
Data Logger : Metone	Model: 466A	S/N.: Y1191

Customer : Life & Environment Co.,Ltd.

Maintenance

Replace Front Bearing	☐ Yes	☑ No
Replace Back Bearing	☐ Yes	☑ No
Replace Shaft Coupler	☐ Yes	☑ No
Replace Hub	☐ Yes	☑ No

Testing Result

Generate Speed	Reading		% Error
RPM	Expect (MPS)	Logger	
0	0.30	0.30	0.0
100	2.94	3.10	-5.4
200	5.61	5.50	2.0
300	8.27	8.30	-0.4
400	10.93	11.10	-1.6
500	13.60	13.50	0.7

Comment : Set the offset of WS is 0.3 m/s.

Test by force to rotate the WS sensor from 0 - 500 round per second.

Data Logger Metone Model 466A, S/N. Y1191

Engineer Name : ..... [redacted] .....

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Certificate of Calibration

Certificate Number : SPR25020200-9 Page : 1 of 3

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Sound Level Meter			
Manufacturer	:	Pulsar			
Model	:	45			
Serial Number	:	PN2449			
ID. Number	:	N/A			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	13 Feb 2025
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	18 Feb 2025
Location of Calibration	:	In-Lab	Recommend Due Date	:	18 Feb 2026
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	:	19 Feb 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference prccedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]
Calibration Officer

Approved by : [redacted]
Authorized Signatory

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25020200-9

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2026

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สปเมตรอโลยี.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR25020200-9

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สปเมตรอโลยี.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบ.com

Certificate of Calibration

Certificate Number : SPR25020200-10

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name : Sound Level Meter
Manufacturer : Pulsar
Model : 45
Serial Number : PN2450
ID. Number : N/A

Environmental Conditions

Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 13 Feb 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 18 Feb 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 18 Feb 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 19 Feb 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]
Calibration Officer

Approved by : [redacted]
Authorized Signatory

Calibration Report

Certificate Number : SPR25020200-10

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2026

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบ.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR25020200-10

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สปเมทรอโลยี.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR25020200-11

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name : Sound Level Meter
Manufacturer : Pulsar
Model : 45
Serial Number : PN2451
ID. Number : N/A

Environmental Conditions

Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 13 Feb 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 18 Feb 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 18 Feb 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 19 Feb 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]
Calibration Officer

Approved by : [redacted]
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Calibration Report

Certificate Number : SPR25020200-11

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2026

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบ.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR25020200-11

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.spmetrologyplace.com

SMART TECH CALIBRATION & SERVICES CO., LTD.
14/506 MOO 3, RANGSIT-NAKHON NAYOK ROAD, LAM PHAK KUT,
THANYABURI, PATHUM THANI 12110, THAILAND
Tel. +662-114-3148 Email : stcal.md@gmail.com Website : stc-cal.com

ilac-MRA
ANAB ANSI National Accreditation Board ACCREDITED CALIBRATION LABORATORY AC-3093

Certificate of Calibration

Certificate No. STCR-2506111-5
Work Order No. STCR-2506111

Customer Name	:	LIFE & ENVIRONMENT CO., LTD. (HEAD OFFICE) 90, 92, 94 Soi On-Nuch 64 Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250
Equipment Name	:	Sound Level Meter
Manufacturer	:	ACO
Model	:	TYPE 6236
Serial Number	:	222219
Control Number	:	SLM-NO.8
Received Date	:	Jun 3, 2025
Calibration Date	:	Jun 4, 2025
Recommended Due Date	:	Jun 4, 2026
Calibration Method	:	Calibration Procedure No. CPE-04-01

Environmental Conditions

Ambient Temperature	:	(25 ± 2) °C
Ambient Relative Humidity	:	(50 ± 15) %RH
Calibration Place	:	Permanent Calibration Laboratory
Condition as received	:	Normal
Calibration Result	:	See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co., Ltd.
5. This results of this report only to the items calibrated.

@smarttechcal

Date of Issue : Jun 27, 2025
Calibrated by : [redacted]

Approved by : [redacted]
([redacted])
Laboratory Manager

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2506111-5

Standards Equipment Used

Equipment Name	Serial No.	Certificate No.	Due Date	Traceability to
Sound Calibrator	N975185	5523631031354566	Nov 6, 2025	MP-TH

Traceability

This calibration is traceable to the International System of Unit via :

- MP-TH : Micro Precision Calibration Laboratory (Thailand) Co., Ltd.

STC
TM

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2506111-5

UUC Range : (30 to 130) dB Resolution : 0.1 dB

Results of Calibration: [ ] Without adjustment [✓] With adjustment

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.6 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.5 dB	113.9 dB	0.17 dB	0.40 dB
SLOW	94.09 dB	93.6 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.5 dB	113.9 dB	0.17 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.7 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.6 dB	114.0 dB	0.07 dB	0.40 dB
SLOW	94.09 dB	93.7 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.6 dB	114.0 dB	0.07 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -

STC TM

SMART TECH CALIBRATION & SERVICES CO., LTD.
14/506 MOO 3, RANGSIT-NAKHON NAYOK ROAD, LAM PHAK KUT,
THANYABURI, PATHUM THANI 12110, THAILAND
Tel. +662-114-3148 Email : stcal.md@gmail.com Website : stc-cal.com

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ANAB ANSI National Accreditation Board ACCREDITED CALIBRATION LABORATORY AC-3093

Certificate of Calibration

Certificate No. STCR-2506111-6
Work Order No. STCR-2506111

Customer Name	:	LIFE & ENVIRONMENT CO., LTD. (HEAD OFFICE) 90, 92, 94 Soi On-Nuch 64 Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250
Equipment Name	:	Sound Level Meter
Manufacturer	:	ACO
Model	:	TYPE 6236
Serial Number	:	222220
Control Number	:	SLM-NO.9
Received Date	:	Jun 3, 2025
Calibration Date	:	Jun 4, 2025
Recommended Due Date	:	Jun 4, 2026
Calibration Method	:	Calibration Procedure No. CPE-04-01
Environmental Conditions		
Ambient Temperature	:	(25 ± 2) °C
Ambient Relative Humidity	:	(50 ± 15) %RH
Calibration Place	:	Permanent Calibration Laboratory
Condition as received	:	Normal
Calibration Result	:	See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co., Ltd.
5. This results of this report only to the items calibrated.

@smarttechcal

Date of Issue : Jun 10, 2025
Calibrated by : [redacted]

Approved by : [redacted]
(M)
Laboratory Manager

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2506111-6

Standards Equipment Used

Equipment Name	Serial No.	Certificate No.	Due Date	Traceability to
Sound Calibrator	N975185	5523631031354566	Nov 6, 2025	MP-TH

Traceability

This calibration is traceable to the International System of Unit via :

- MP-TH : Micro Precision Calibration Laboratory (Thailand) Co., Ltd.

STC
TM

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2506111-6

UUC Range : (30 to 130) dB Resolution : 0.1 dB

Results of Calibration: [ ] Without adjustment [✓] With adjustment

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.5 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.4 dB	114.0 dB	0.07 dB	0.40 dB
SLOW	94.09 dB	93.5 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.4 dB	114.0 dB	0.07 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.5 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.5 dB	114.1 dB	-0.03 dB	0.40 dB
SLOW	94.09 dB	93.5 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.5 dB	114.1 dB	-0.03 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -

STC TM

SMART TECH CALIBRATION & SERVICES CO., LTD.
14/506 MOO 3, RANGSIT-NAKHON NAYOK ROAD, LAM PHAK KUT,
THANYABURI, PATHUM THANI 12110, THAILAND
Tel. +662-114-3148 Email : stcal.md@gmail.com Website : stc-cal.com

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ANAB ANSI National Accreditation Board ACCREDITED CALIBRATION LABORATORY AC-3093

Certificate of Calibration

Certificate No. STCR-2506111-7
Work Order No. STCR-2506111

Customer Name	:	LIFE & ENVIRONMENT CO., LTD. (HEAD OFFICE) 90, 92, 94 Soi On-Nuch 64 Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250
Equipment Name	:	Sound Level Meter
Manufacturer	:	ACO
Model	:	TYPE 6236
Serial Number	:	222222
Control Number	:	SLM-NO.11
Received Date	:	Jun 3, 2025
Calibration Date	:	Jun 4, 2025
Recommended Due Date	:	Jun 4, 2026
Calibration Method	:	Calibration Procedure No. CPE-04-01

Environmental Conditions

Ambient Temperature	:	(25 ± 2) °C
Ambient Relative Humidity	:	(50 ± 15) %RH
Calibration Place	:	Permanent Calibration Laboratory
Condition as received	:	Normal
Calibration Result	:	See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co., Ltd.
5. This results of this report only to the items calibrated.

@smarttechcal

Date of Issue : Jun 27, 2025
Calibrated by : [redacted]

Approved by :
([redacted])
Laboratory Manager

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2506111-7

Standards Equipment Used

Equipment Name	Serial No.	Certificate No.	Due Date	Traceability to
Sound Calibrator	N975185	5523631031354566	Nov 6, 2025	MP-TH

Traceability

This calibration is traceable to the International System of Unit via :

- MP-TH : Micro Precision Calibration Laboratory (Thailand) Co., Ltd.

STC
TM

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2506111-7

UUC Range : (30 to 130) dB Resolution : 0.1 dB

Results of Calibration: [ ] Without adjustment [✓] With adjustment

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.4 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.4 dB	114.0 dB	0.07 dB	0.40 dB
SLOW	94.09 dB	93.4 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.4 dB	114.0 dB	0.07 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.3 dB	94.1 dB	-0.01 dB	0.40 dB
	114.07 dB	113.5 dB	114.0 dB	0.07 dB	0.40 dB
SLOW	94.09 dB	93.3 dB	94.1 dB	-0.01 dB	0.40 dB
	114.07 dB	113.5 dB	114.0 dB	0.07 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบ.com

Certificate of Calibration

Certificate Number : SPR24120388-4

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial Number : 142011
ID. Number : SLM-NO.5

Environmental Conditions

Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 26 Dec 2024
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 14 Jan 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 14 Jan 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 15 Jan 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]
Calibration Officer

Approved by : [redacted]
(Mr.Poothipong A.)
Authorized Signatory

Calibration Report

Certificate Number : SPR24120388-4

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR24120388-4

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สปเมตรอโลยี.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือ.com

Certificate of Calibration

Certificate Number : SPR25020200-8

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Sound Level Meter			
Manufacturer	:	ACO			
Model	:	6236			
Serial Number	:	142013			
ID. Number	:	SLM-NO.7			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	13 Feb 2025
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	18 Feb 2025
Location of Calibration	:	In-Lab	Recommend Due Date	:	18 Feb 2026
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	:	19 Feb 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]
Calibration Officer

Approved by [redacted]
Authorized Signatory

Calibration Report

Certificate Number : SPR25020200-8

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2026

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบ.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR25020200-8

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	114.0	114.0	0.0	0.0	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบ.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24060488-15

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	: Noise Dose Meter		
Manufacturer	: SOUNDTEK		
Model	: ST-130		
Serial Number	: 220100105		
ID. Number	: NT-07		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 28 Jun 2024
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 28 Jun 2024
Location of Calibration	: In-Lab	Recommend Due Date	: 28 Jun 2025
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 29 Jun 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]

Calibration Officer

Approved by : [redacted]

Authorized Signatory

Calibration Report

Certificate Number : SPR24060488-15

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 ต่อสาย www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR24060488-15

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

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Certificate of Calibration

Certificate Number : SPR24060488-14 Page : 1 of 3

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Noise Dose Meter			
Manufacturer	:	SOUNDTEK			
Model	:	ST-130			
Serial Number	:	220100103			
ID. Number	:	NT-06			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	28 Jun 2024
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	28 Jun 2024
Location of Calibration	:	In-Lab	Recommend Due Date	:	28 Jun 2025
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	:	29 Jun 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]
Calibration Officer

Approved by : [redacted]
( )
Authorized Signatory

Calibration Report

Certificate Number : SPR24060488-14

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR24060488-14

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.4	93.4	-0.6	-0.6	0.15
114	113.3	113.3	-0.7	-0.7	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.3	93.3	-0.7	-0.7	0.15
114	113.2	113.2	-0.8	-0.8	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายงาน www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24060488-16 Page : 1 of 3

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Noise Dose Meter			
Manufacturer	:	SOUNDTEK			
Model	:	ST-130			
Serial Number	:	220300020			
ID. Number	:	NT-09			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	28 Jun 2024
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	28 Jun 2024
Location of Calibration	:	In-Lab	Recommend Due Date	:	28 Jun 2025
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	:	29 Jun 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]

Calibration Officer

Approved by : [redacted]

Authorized Signatory

Calibration Report

Certificate Number : SPR24060488-16

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR24060488-16

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายต่อ www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24040397-3

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Noise Dose Meter			
Manufacturer	:	SOUNDTEK			
Model	:	ST-130			
Serial Number	:	170800296			
ID. Number	:	NT-02			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	30 Apr 2024
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	04 May 2024
Location of Calibration	:	In-Lab	Recommend Due Date	:	04 May 2025
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	:	05 May 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]

Calibration Officer

Approved by : [redacted]

Authorized Signatory

Calibration Report

Certificate Number : SPR24040397-3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 ต่อ www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate No. : SPR24040397-3

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24040397-5

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Noise Dose Meter			
Manufacturer	:	SOUNDTEK			
Model	:	ST-130			
Serial Number	:	190500072			
ID. Number	:	NT-05			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	30 Apr 2024
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	04 May 2024
Location of Calibration	:	In-Lab	Recommend Due Date	:	04 May 2025
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	:	05 May 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]

Calibration Officer

Approved by : [redacted]

Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

Calibration Report

Certificate Number : SPR24040397-5

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 ต่อสาย www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 ต่อสาย www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate No. : SPR24040397-5

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24040397-4 Page : 1 of 3

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Noise Dose Meter			
Manufacturer	:	SOUNDTEK			
Model	:	ST-130			
Serial Number	:	190500065			
ID. Number	:	NT-03			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	30 Apr 2024
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	04 May 2024
Location of Calibration	:	In-Lab	Recommend Due Date	:	04 May 2025
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	:	05 May 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]

Calibration Officer

Approved by : [redacted]

Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

Calibration Report

Certificate Number : SPR24040397-4

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate No. : SPR24040397-4

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.

Certificate of Calibration

Certificate Number : SPR24120388-5 Page : 1 of 3

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Acoustic Calibrator			
Manufacturer	:	Quest Technologies			
Model	:	QC-20			
Serial Number	:	QOF110014			
ID. Number	:	N/A			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	26 Dec 2024
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	14 Jan 2025
Location of Calibration	:	In-Lab	Recommend Due Date	:	14 Jan 2026
Calibration Procedure	:	In-House Method	Date of Issue	:	15 Jan 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]

Calibration Officer

Approved by [redacted]

Authorized Signatory

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR24120388-5

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Measuring Receiver	8902A	2950A02471	E3U2401129	05 Sep 2025
AUDIO Analyzer	8903B	3011A09975	EL02442/24	23 Jan 2025

Traceability

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

NA - NA Caltechnologies Co., Ltd.

PCAL - Professional Calibration & Services Co.,Ltd

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

Result of Calibration

Certificate Number : SPR24120388-5

Function : Sound Level Calibrator

UUC Setting (± dB)	Standard Reading (dB)	Error (dB)	Uncertainty (± dB)
94	94.0	0.0	1.5
114	114.0	0.0	1.5

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

SARTORIUS

Accredited by

NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 25BNA0178

Object	Electronic non-automatic weighing instrument
Manufacturer	Sartorius
Type	MSE125P-100-DU
Serial | QM Ident. no.	0028606077 | N/A
Customer	Life and Environment Co., Ltd. 90, 92, 94 Soi On-Nuch 64,Srinakarin Road, On-Nuch, Suanluang, Bangkok 10250. Thailand.
Order no.	268985
Number of pages	4
Date of calibration	12 Sep 2025

This calibration certificate documents the traceability to national standards.

Uncertainties of measurements are taken into account when only statements of compliance are made.

This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.

This certificate relate and apply this equipment only.

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date of issue 12 Sep 2025

Approval of the Calibration Certificate

[redacted]

Person in charge

[redacted]

Calibration object

Multi interval instrument

Model	MSE125P-100-DU	
Serial Number	0028606077	
QM Ident. no | Inventory no.	N/A | ---	
Range	1	2
Maximum capacity (Max. load)	60.00000 g	120.0000 g
Measured up to	60.00000 g	120.0000 g
Scale interval	0.00001 g	0.0001 g

Place of calibration

Address	According to page 1
Department | Cost center	Laboratory Testing. | ---
Building | Floor	--- | 1st Floor.
Room	Air(TSP/PM10) Testing Laboratory.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET Calibration Guide No. 18, Version 4.0 (11/2015) - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	Testo 174H(Traceable to SI unit through ENTECH) SN: 84391651	10 Nov 2025
Test weight set OIML R111 E2	Certificate No.C02241568, E2(Traceable to SI unit through DKSH)	29 Aug 2026

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	12 Sep 2025
Temperature at place of calibration | Temp. diff. $T_{weights}$ - T_{place}	25.6 °C | 0.1 K
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 48.8 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 50 g | 100 g		
	50 g	**100 g**
1	49.99999 g	100.0000 g
2	50.00000 g	100.0000 g
3	49.99999 g	100.0000 g
4	49.99999 g	100.0000 g
5	49.99999 g	100.0000 g
6	50.00000 g	100.0000 g
7	50.00000 g	100.0000 g
8	49.99999 g	100.0000 g
9	49.99999 g	100.0000 g
10	50.00000 g	100.0000 g
	s = 0.000005 g	s = 0.00000 g

Eccentricity

Test load (nominal):	**50 g**
Center	49.99999 g
Front left	49.99998 g
Back left	50.00001 g
Back right	50.00007 g
Front right	50.00000 g
Maximum deviation from centric loading indication $\lvert\Delta I_{ecc}\rvert_{max}$ = 0.00008 g	

Error of indication

Testload L	**Indication** I	**Error** E	**Expansion factor** k	**Uncertainty** $U(E)$	**Uncertainty relative** $U_{rel}(E)$
0.01000 g	0.01001 g	0.00001 g	2.00	0.000024 g	0.24 %
0.10000 g	0.10001 g	0.00001 g	2.00	0.000037 g	0.037 %
1.00001 g	1.00002 g	0.00001 g	2.00	0.000026 g	0.0026 %
9.99999 g	9.99999 g	0.00000 g	2.00	0.000069 g	0.00069 %
19.99995 g	19.99997 g	0.00002 g	2.00	0.000069 g	0.00035 %
54.99995 g	54.99995 g	0.00000 g	2.00	0.00017 g	0.00031 %
69.9999 g	69.9999 g	0.0000 g	2.00	0.00017 g	0.00024 %
79.9999 g	80.0000 g	0.0001 g	2.00	0.00019 g	0.00023 %
99.9999 g	100.0000 g	0.0001 g	2.00	0.00017 g	0.00017 %
109.9999 g	110.0000 g	0.0001 g	2.00	0.00028 g	0.00025 %
119.9999 g	119.9999 g	0.0000 g	2.00	0.00028 g	0.00023 %
Maximum error of indication		$\lvert E\rvert_{max}$ = 0.00010 g			

$U_{rel}(E)$ is the quotient of $U(E)$ and test load L. The uncertainty of measurement $U(E)$ is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

Uncertainty of measurement in use

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	$1 \cdot 10^{-6}$/K

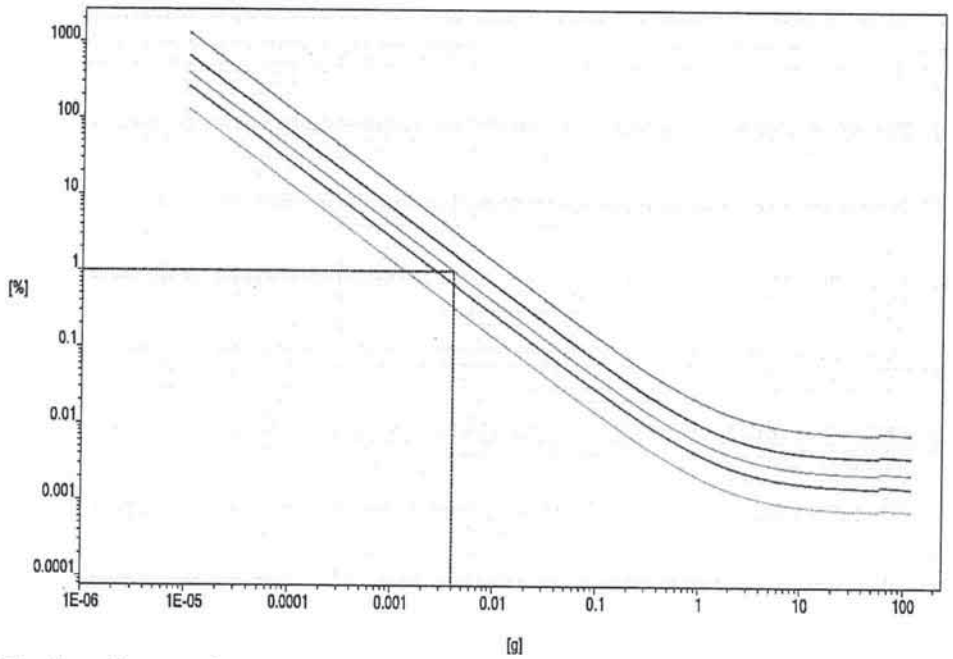
Uncertainty of the weighing result $U_{gl}(W)$

Partial weighing range 1 | 0.00000 g...60.00000 g	$U_{gl}(W) = 0.000013\ g + 7.28 \cdot 10^{-6} \cdot R$
Partial weighing range 2 | 60.00000 g...120.0000 g	$U_{gl}(W) = 0.000058\ g + 7.03 \cdot 10^{-6} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading *R* into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from Max1	Net indication *R*	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	0.60000 g	0.000017 g	0.0029 %
25 %	15.00000 g	0.00012 g	0.00081 %
50 %	30.00000 g	0.00023 g	0.00077 %
75 %	45.00000 g	0.00034 g	0.00076 %
100 %	60.00000 g	0.00045 g	0.00075 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Safety factor
10
5
3
2
1

Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.00396 g

SITHIPORN associates

Certificate of Calibration

Method 5 Pre-Test Calibration - Liters (L)

UUT Meter Console Information

Model #:	XC-572
Serial #:	605186
DGM Model #:	SK25EX
DGM Serial #:	00009102

Calibration Conditions

Bar. Pressure (mm Hg):	758.4
Ambient Temperature (ºC):	25.7
Relative Humidity (%):	65
Altitude (m):	1.50
Bar. Pressure Corr. (mm Hg):	758.3

Calibration Reference

Work No. : **SVO39721** Calibration No.: **SA2025001** Judgment : **Pass** According to note :

Reference Equipment

WTM Model:	W-NK-5B	Serial No.:	546321
Gamma:	1.0108	Cal.Due	21-Mar-25
Thermometer:	FLUKE714	Serial No.:	9038005

Factors/Conversions

Std. Temp. (K):	298.15
Std. Press. (mm Hg):	760
K_1 (K/mm Hg):	0.3923

UUT Meter (DGM) / **Reference Meter (WTM)**

Run Time (seconds)	Orifice, ΔH (mm H2O)	UUT Meter (DGM) Volume (L)			UUT Meter (DGM) Meter Temperature (ºC)		Meter Pressure (mm H2O)	Reference Meter (WTM) Volume (L)			Reference Meter (WTM) Outlet Temperature (ºC)	
		Initial (L)	Final (L)	Total (L)	Initial	Final		Initial	Final	Total	Initial	Final
Θ	$P_{m(g)}$	V_{mi}	V_{mf}	V_m	t_{mi}	t_{mf}	P_w	V_{wi}	V_{wf}	V_w	t_{wi}	t_{wf}
900	13.00	331.4	498.2	166.8	24.0	25.0	1.5	500654.25	500818.48	164.2	26.2	26.1
600	25.00	502.7	657.5	154.8	25.0	25.0	2.0	500823.05	500975.59	152.5	26.1	26.0
480	50.00	664.7	843.3	178.6	25.0	26.0	3.0	500982.83	501159.41	176.6	26.0	26.0
420	80.00	849.6	1049.5	199.9	26.0	26.0	4.5	501165.67	501363.32	197.7	26.0	26.0
300	120.00	1068.4	1243.2	174.8	26.0	26.0	5.5	501381.90	501554.81	172.9	26.0	26.0

Standardized Data / **Calibration Results**

Reference Meter (L)		UUT Meter (L)		Correction Factor		ΔH @ (mm H2O)	
Std. Vol.	Std. Flow	Std. Vol.	Std. Flow	Value	Variation	0.0212 SCMM	Variance
$V_{w(std)}$	$Q_{w(std)}$	$V_{m(std)}$	$V_{w(std)}$	Y	ΔY	ΔH@	ΔΔH@
165.60	11.04	166.91	11.0	0.9921	-0.0062	50.4	2.117
154.05	15.41	154.82	15.4	0.9950	-0.0033	49.9	1.590
178.80	22.35	178.76	22.3	1.0002	0.0018	47.7	-0.626
200.87	28.70	200.32	28.7	1.0027	0.0043	46.7	-1.630
176.15	35.23	175.84	35.2	1.0018	0.0034	46.8	-1.451
				0.9984	**= Y Avg.**	**48.3**	**= ΔH@ Avg.** (Metric)

Note1 : For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

Note2 : For $\Delta H_{@}$, orifice pressure differential that equates to 0.0212m^3/min at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H_20.

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Calibrator : [redacted] Signature : [redacted] Date : 28/Nov/24

The instruments listed and described on this certificate have been calibrated against standards traceable to the National Institute of Standards and Technology (N.I.S.T.) and in reference to EPA Method 5, Section 10.3.1.

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Calibration Certificate Appendix

METHOD 5 PRE-TEST CONSOLE CALIBRATION

SITHIPORN
Calibration No.: **SA2025001**

UUT Meter / Console Information

Model #: XC 572-V Serial number: 605186
DGM Model #: SK25EX Serial number: 00009102

Check the Diagnosis Check the system before calibrating.

	Not Passed	Passed
-Visual instrument normalcy	☐	☑
-Electrical and Temperature Systems	☐	☑
-Inclined Manometer with Systems	☐	☑
-Pressure Gauge	☐	☑
-Leak Check	☑Vacuum : Pass	☑Pressure : Pass
☑ PM and Calibration	☐ Repairing before Calibration	

Nomenclature

Pb - Barometric Pressure
DGM - Dry Gas Meter
K_1 - Constant based on standard temp and press
Θ - Run time, in minutes
P_m - ΔH (Meter Pressure, gauge)
V_m - Volume collected by test meter, corrected for STP
$Q_{m(std)}$ - Calculated flow rate of test meter
K' - Critical orifice coefficient
P_w - Measured pressure of reference meter
t_w - Temperature measured in reference meter
t_m - Temperature measured in test meter
Y - Ratio of volume collected from test meter and orifice

Equations

$$K_1 = \frac{T_{std}}{P_{std}}$$

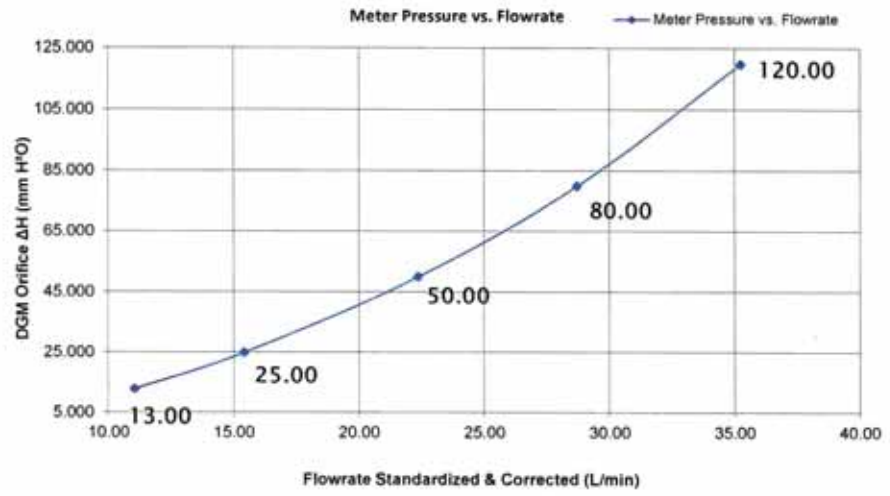
$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(y)}}{13.6})}{T_w}$$

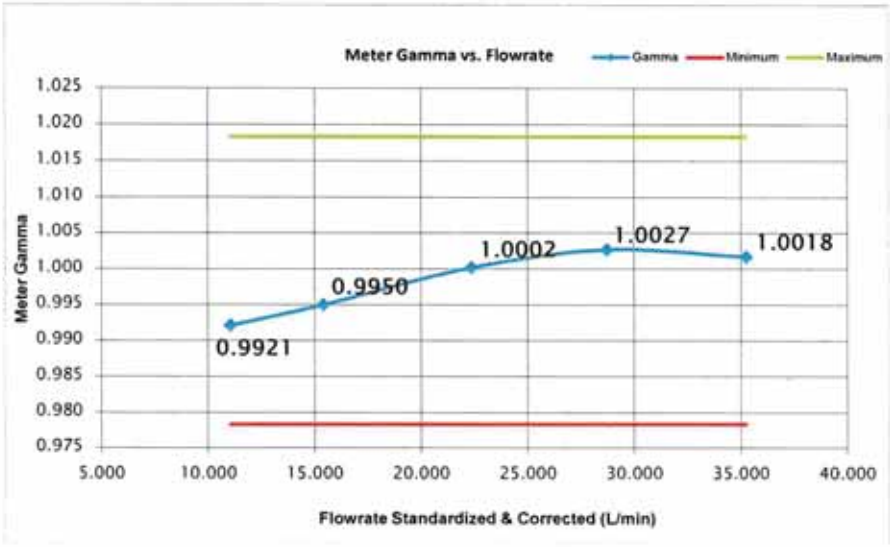
$$V_{m(std)} = \frac{K_1 V_m (P_{bar} + \frac{\Delta H}{13.6})}{T_m}$$

$$Y = \frac{V_{w(std)}}{V_{m(std)}} \qquad Q_{w(std)} = \frac{V_{w(std)}}{\Theta}$$

$$Metric\ \Delta H_@ = \frac{P_{m(y)} * 0.0011696 * (P_{bar} + \frac{P_{m(y)}}{13.6})}{T_m} * \left(\frac{T_w * \Theta}{V_w * P_{bar}}\right)^2$$

Calibration Graphs





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Certificate of Calibration

Method 5 Console Sensor Calibration - Metric Units

Console Information

Model #:	XC-572
Serial #:	605186
Units:	Metric

Calibration Conditions

Pbar (mm. Hg):	758.40
Humidity (%):	65
Tamb (°C):	25.7
Elevation (m):	1.5
Corr. Pbar (mm. Hg):	758.40

Calibration Reference

Calibration No. :	**SA2025001**
Work No. :	SVO39721

Reference Devices

TC Calibrator Model:	FLUKE 714
Serial No.:	9038005

Temperature Sensors Calibration Data

Reference Temp.		Test Thermocouple Calibrations						Reference Point Status[2]
		Aux	Stack	Probe	Oven	Filter	Exit	
Point	*°C*	*°C*	*°C*	*°C*	*°C*	*°C*	*°C*	*Pass/Fail*
1	-18	-17	-17	-17		-17	-17	PASS
2	38	38	38	38		39	39	PASS
3	93	94	94	94		94	94	PASS
4	149	150	150	150		150	150	PASS
5	260	261	261	261		261		PASS
6	371		374					PASS
7	482		486					PASS
8	593		597					PASS
9	816		824					PASS
10	1038		1046					PASS
		±3.0°C,5.4°F	1.50%	±3.0°C,5.4°F	±3.0°C,5.4°F	±3.0°C,5.4°F	±1.0°C,2.0°F	**PASS**

Overall Audit Status

DGM Temperature Sensor

Ref Point	Reference Temp.	DGM Thermocouple Sensor Reading	Δt_{abs}	Maximum	Reference Status[2] (±1%)
#	*°C*	*°C*	*°C*	%	*Pass/Fail*
Ice Water	0.2	0	0.07%	0.07%	PASS
Ambient	25.7	26	0.06%		

Temperature Controller

Heater Controller Set point	Reference Measure (μ)	XC-572 Thermometer	Deviated to set point	ΔT_{abs} ±3%	Temp. Controler Status[3]
120 °C	*°C*	*°C*	*°C*	*°C*	*Pass/Fail*
Probe	123.6	126	-2	0.60%	PASS
Heat box	122.7	123	0	0.08%	PASS

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Notes

[1] Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more

2 For valid test results, the maximum difference between test and reference readings should be temperature from the reference reading and the exit thermocouple which should be less than 2°F (1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

[3] Heater control acceptance limit Temperature can be maintained at 120 °C ±14 °C, ±57 °F within ±1.5%(^{2}) at a flow rate of 20 lpm.

Signature: [redacted] Date : 28/Nov/24

I certify that the above Thermocouple Sensors were calibrated in accordance with US EPA Methods 2 and 5, CFR 40 Part 60.

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Revised: 2023/01/01

Console Sensor Audit QA Sheet

Meter Console Information (UUT)

Model #: XC-572
Serial #: 605186
Units: Metric

Calibration Conditions

Pbar (mm. Hg): 30.00
Humidity (%): 65%
Amb. Temp. (°C): 69
Altitude (m): 100.0
Corrected Pbar (mm. Hg): 29.90

Calibration No. : SA2025001
Work No. : SVO39721

Reference Devices

TC Calibrator Model: FLUKE 714
Serial No.: 9038005
Digital Manometer Model: Dwyer DPGA-00
Serial No.: 721

Audit Data

Reference Point	Reference Temp.	Console Thermocouple Audit						Reference Point Status[1]
		Aux	Stack	Probe	Oven	Filter	Exit	
#	°C	°C	°C	°C	°C	°C	°C	*Pass/Fail*
1	26.5	27	27	27	27	27	27	PASS
Acceptance criteria		3.0°C,5.4°F	1.50%	3.0°C,5.4°F			1.0°C,2.0°F	

Reference Thermocouple ID: 90728323

Ref Point	Reference Temp.	DGM Thermocouple Sensor Reading	ΔTabs4	Maximum	Reference Status (±1%)
#	°C	°C	°C	%	*Pass/Fail*
Ice Water	0.2	0	0.07%	0.07%	PASS
Ambient	25.7	26	0.06%		

Internal temperature thermocouple is not audited to EPA standards, and should not be used as an official reference for ambient temperature.

Console Vacuum Audit			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status[3]
#	*mm. Hg*	*mm. Hg*	*Pass/Fail*
1	23.90	24.00	PASS

Notes

[1]For valid test results, the maximum difference between test and reference readings should be temperature from the reference reading and the exit thermocouple which should be less than 2°F (1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

[3]For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg)

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Signature: [redacted]

Date: 28/Nov/24

I certify that the above Thermocouple, Barometric, and Vacuum Sensors were calibrated and audited in accorcance with US EPA Methods, CFR 40 Part 60.

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Revised: 2023/01/04

Nozzle Calibration

Nozzle Information

Manufacturer: Apex
Type: Stainless Steel
Identification: _____

Calibration Conditions

Bar. Pressure (mm Hg): 756.5
Ambient Temperature (°C): 26.0
Relative Humidity (%): 65

Calibration Reference

Calibration No.: SA2023001
Work No. : SVO22200
Units: Metric

Reference Equipment	Serial No	Cal No.:	Cal.due:
Vernier, 0-250mm 0.01 mm increments model Mitutoyo	3038570	L202310355-0001	25/Mar/25

Calibration Method

Follow the USEPA Method 5 nozzle size calibration procedure. (ref. 40 CFR PART 60).

Calibration Result

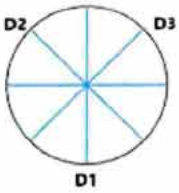
ID No.	Sizes	measured every 60° nozzle			($D_1 + D_2 + D_3$) / 3	Different ≤ 0.100 mm.	
	mm.	D_1	D_2	D_3	Davg	1	Judgment
4	3.1	3.22	3.24	3.25	3.237	0.030	PASS
6	4.6	4.46	4.47	4.45	4.460	0.020	PASS
8	6.2	6.25	6.28	6.24	6.257	0.040	PASS
10	7.8	7.80	7.82	7.83	7.817	0.030	PASS
12	9.4	9.40	9.40	9.41	9.403	0.010	PASS
14	10.9	10.89	10.88	10.91	10.893	0.030	PASS
16	12.6	12.74	12.75	12.77	12.753	0.030	PASS

Where :

D1, D2, D3 = There difference nozzle diamiters at 60 degrees to each other, each measured to the nearest 0.025 mm or 0.001 inch

ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm or 0.004 inch

D avg = ($D_1 + D_2 + D_3$) / 3



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Signature [redacted]

Date : 28/Nov/24

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Revised: 2023/01/04

Sampling Probe and Pitot validation

Samplig Probe Information

Manufacturer:	Apex
Probe Type:	SS , 6ft
Probe No. :	-
Pitot tube Type:	S Type 3/8 Inc.
Pitot tube No.:	-

Calibration Conditions

Bar. Pressure (mm Hg):	759.5
Ambient Temperature (°C):	26.0
Relative Humidity (%):	53
Units:	Metric

Calibration Reference

Calibration No.: **SA2025001**

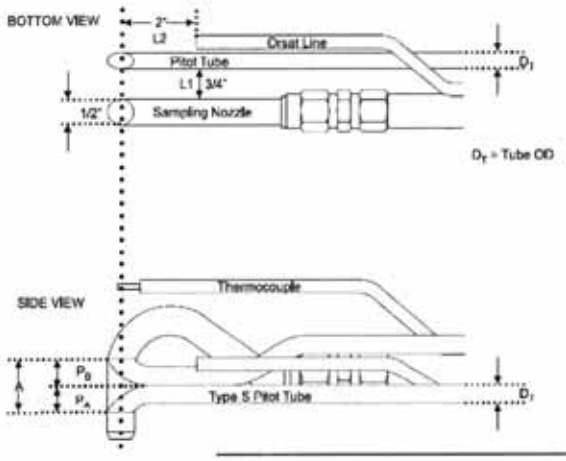
Work No.: SVO39721

Reference Devices

- Vernier, 0-250mm 0.01 mm increments

Model: Mitutoyo,ID No.:EPD1-VER-57-1-CEN-01

Validation method : Follow the USEPA Method 5 pitot tubs (S type) calibration procedure. (ref. 40 CFR PART 60).



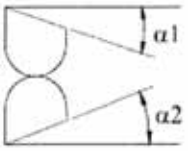
Sampling Probe Validation with Tune up

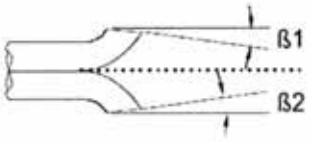
☑ : Measuring and aligning with 1/2" sample nozzle(12.7 mm)

	Measured	Acceptance Standard
L_1 =	18.78 mm	(19.05 mm. or 0.75 in.)
L_2 =	48.43 mm	(50.8 mm. or 2.0 in.)
D_T =	9.52 mm	(9.525 mm., 0.375 in.)
A =	22.03 mm	($2.1\ D_T \le A \le 3D_T$)
$A/2D_T$ =	1.157 mm	($1.05\ P_A / D_T \le A \le 1.5$)

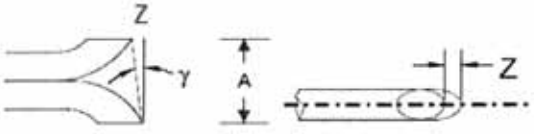
Pitot Tube Validations and Engles measurement Result

☑ : Measure results after maintenance and adjustments.









P_B Size		Acceptancnce of correctness
α_1 =	0.70 °	≤ 10°
β_1 =	2.05 °	≤ 5°
P_A Size		
α_2 =	0.55 °	≤ 10°
β_2 =	2.10 °	≤ 5°

Engles measurement		fhy Calculated Result	Acceptance Criteria
W =	0.85 °	0.339 mm	W < 0.0794 mm. (0.03125 ir
Z =	0.75 °	0.288 mm	Z < 3.175 mm. (0.125 in.)

Can be use **0.84** for Cp(s) if the type of face-opening misafgnment show above with not affect the base line value of Cp(s) Solong as standard range.

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Signature: Vaerojn Date: 28/Nov/24

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Certificate of Calibration

DGM with Totallizer Calibration - Liters (L)

UUT Meter Console Information	
Model :	XC-572
Serial :	605186
Totalizer display:	N/A
DGM model :	SK25EX
Serial :	00009102

Calibration Conditions	
Bar. Pressure (mm Hg):	756.0
Ambient Temperature (°C):	25.7
Relative Humidity (%):	65
Altitude (m):	1.50

Factors/Conversions	
Std. Temp. (K):	298.15
Std. Press. (mm Hg):	760
K_1 (K/mm Hg):	0.3923

Work No.: SVO39721 **Calibration No. :** SA2025001

Reference Equipment

WTM Model:	W-NK-5A	WTM Serial:	535476
WTM Cal. Due Date:	21-Mar-25	Gamma:	1.0108
Thermometer:	Fluke 714	Serial #:	N/A

UUT Meter (DGM)

Run Time (seconds)	Flow Rate (Rotameter)	Volume(L)			Meter Temperature (°C)	
		Initial	Final	Total	Initial	Final
Θ	(L/Min)	V_{wi}	V_{wf}	V_w	t_{mi}	t_{mf}
900	1.00	1243.60	1258.70	15.10	25.0	25.0
600	2.00	1257.70	1278.50	20.80	25.0	25.0
480	2.50	1280.00	1300.08	20.08	25.0	26.0
420	3.00	1303.60	1325.20	21.60	26.0	26.0
300	3.50	1327.00	1344.60	17.60	26.0	26.0

Reference Meter (WTM)

Meter Pressure ($mm H_2O$)	Volume (L)			Outlet Temperature (°C)	
	Initial	Final	Total	Initial	Final
P_w	V_{wi}	V_{wf}	V_w	t_{wi}	t_{wf}
-1.0	501559.36	501574.53	15.17	26.0	26.0
-1.0	501575.20	501596.07	20.87	26.0	26.0
-1.0	501601.18	501621.39	20.21	26.0	26.0
-1.0	501627.68	501649.42	21.74	26.0	26.0
-1.0	501653.41	501671.17	17.76	26.0	26.0

Standardized Data

Scaling Factor

Test meter		Reference Meter		Gamma	
Std. Vol.	Std. Flow Rate	Std. Volume	Std. Flow Rate	Value	Variation
Vm_{std} (L)	Qw_{std} (L/min)	Vw_{std} (L)	Qw_{std} (L/min)	Y	ΔY
15.022	1.013	15.201	1.013	1.0119	-0.003
20.695	2.091	20.912	2.091	1.0105	-0.004
19.946	2.531	20.251	2.531	1.0153	0.000
21.421	3.112	21.784	3.112	1.0170	0.002
17.455	3.559	17.796	3.559	1.0195	0.005
				1.0148	**DGM Y Avg.(1)**

Calibration Results

Rotameter Calibration		
Rotameter	Std. Flow.	Variation
(L/Min)	(L/min)	(L/min)
1.00	1.01	-0.01
2.00	2.09	-0.09
2.50	2.53	-0.03
3.00	3.11	-0.11
3.50	3.56	-0.06

Note:1. For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

Note:2 For the Scaling Calibration Factor.(SC), it is the ratio of the display to adjust the Y value to be close to 1.000, equal to the reference standard.

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Technical: [redacted] Signature: [redacted] Date: 28/Nov/2024

The instruments listed and described on this certificate have been calibrated against standards traceable to the National Institute of Standards and Technology (N.I.S.T.) and in reference to EPA Method 5, Section 10.3.1. and EPA Method 6, Section 10.1.3.

Calibration Certificate Appendix

DGM with Totallizer Calibration

Nomenclature

P_b - Barometric Pressure

DGM - Dry Gas Meter

K_1 - Constant based on standard temp and press

Θ - Run time, in minutes

P_m - ΔH (Meter Pressure, gauge)

V_m - Volume collected by test meter, corrected for STP

$Q_{m(std)}$ - Calculated flow rate of test meter

K' - Critical orifice coefficient

P_w - Measured pressure of reference meter

t_w - Temperature measured in reference meter

t_m - Temperature measured in test meter

Y - Ratio of volume collected from test meter and orifice

sc - Scaling Factor

$Counts_{std}$ - Number of pulse counts, standardized

C_{total} - Number of raw pulse counts of a calibration run

Equations

$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(g)}}{13.6})}{T_w}$$

$$K_1 = \frac{T_{std}}{P_{std}}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

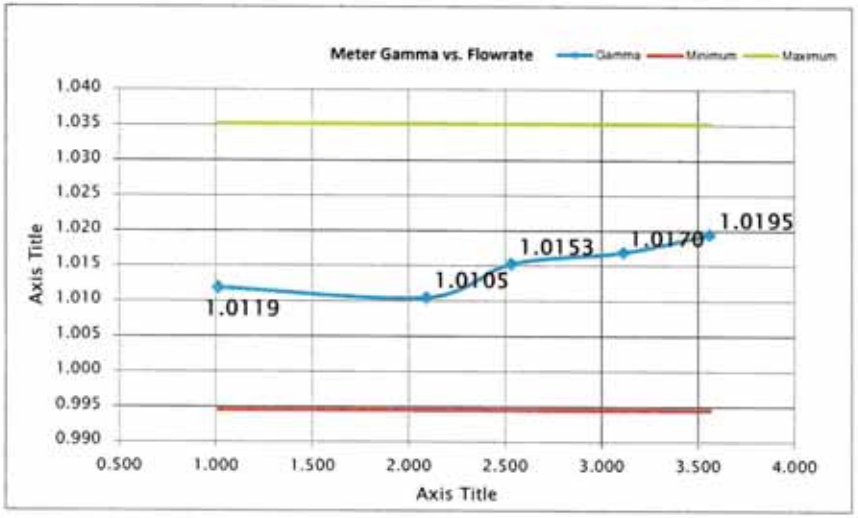
$$Q_{w(std)} = \frac{V_{w(std)}}{\Theta}$$

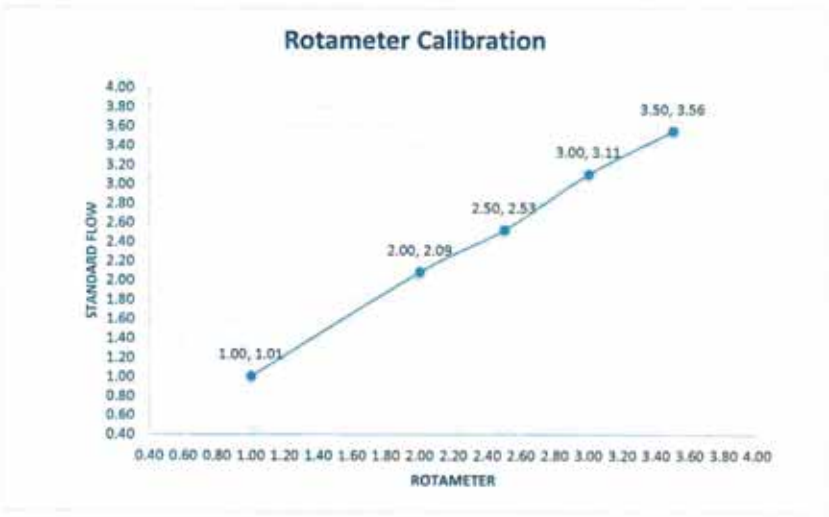
$$Counts_{std} - K_1 \frac{C_{total} * (P_{bar} + \frac{P_{m(g)}}{13.6})}{T_m}$$

$$Y_{sc} - \frac{V_{w(std)}}{Counts_{std}}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

Calibration Graphs





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Certificate of Calibration

Method 6 Console Sensor Calibration - Metric Units

Console Information

Model #:	XC-572
Serial #:	605186
Temp Dsp	LASCAR
Serial :	DTM-995B
Units:	Metric

Calibration Conditions

Pbar (mm. Hg):	756.00
Humidity (%):	47
Tamb (°C):	25.7
Elevation (m):	1.5
Corr. Pbar (mm. Hg):	756.0

Calibration Reference

Calibration No. :	SA2025001
Work No. :	SVO39721

Reference Devices

TC Calibrator Model:	FLUKE 714
Serial No.:	9038005

Temperature Sensors Calibration Data

Reference Temp.		Test Thermocouple Calibrations					Reference Point Status[2]
		Aux	Stack	Probe	Filter	Exit	
Point	*°C*	*°C*	*°C*	*°C*	*°C*	*°C*	*Pass/Fail*
1	-18	-18	-18	-18	-18	-18	PASS
2	38	39	39	39	39	39	PASS
3	93	94	94	94	94		PASS
4	149	150	150	150	150		PASS
5	260	261	261	261	261		PASS
6	371		374				PASS
7	482		486				PASS
8	593		597				PASS
9	816		824				PASS
10	1038		1046				PASS
		±3.0°C,5.4°F	1.50%	±3.0°C,5.4°F	±3.0°C,5.4°F	±2.0°C,3.6°F	**PASS**

Overall Audit Status

DGM Temperature Sensor

Ref Point	Reference Temp.	DGM Thermocouple Sensor Reading	Δt_{abs}	Maximum	Reference Status[2] (±1%)
#	°C	°C	°C	%	*Pass/Fail*
Ice Water	0.2	0	0.07%	0.07%	PASS
Ambient	25.7	26	0.06%		

Temperature Controller

Heater Controller Set point	Reference Measure (μ)	XC-572 Thermometer	Deviated to set point	ΔT_{abs} ±3%	Temp. Controler Status[3]
120 °C	°C	°C	°C	°C	*Pass/Fail*
Probe	123.6	126	-2	0.60%	PASS
Filters	122.7	123	0	0.60%	PASS

Notes

[1] Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more

2 For valid test results, the maximum difference between test and reference readings should be temperature from the reference reading and the exit thermocouple which should be less than 2°F (1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

[3] Heater control acceptance limit Temperature can be maintained at 120 °C ±14 °C, ±57 °F within ±1.5%(^{2}) at a flow rate of 20 lpm.

บริษัท สิทธิพรแอสโซซิเอส จำกัด
SITHIPORN ASSOCIATES COMPANY LIMITED

Signature: [redacted] Date : [redacted]

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Certificate No. : 25P29

Equipment :	Digital Manometer
Manufacturer:	Dwyer
Model :	477
Serial No.:	477-5-FM
ID No.:	SP-362
Condition As-Received:	Used Item
Received Date:	03 January 2025
Calibration Date:	09 January 2025

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

Reference:	2501-0065WN
Ambient Temperature:	(23 ± 2) °C
Relative Humidity:	(50 ± 15) %
Atmospheric Pressure:	1010 mbar

Submitted by: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-Nuch 64, Srinakarin Road,
On-Nuch, Suanluang, Bangkok 10250

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0218-24	24 Sep 2025

2.This instrument was installed in horizontal orientation and center of connector was used as the reference level.

3.This result of calibration was made on requested at the point specified by customer.

4.Scale and conversion factor is 1 kPa = 7.50062 mmHg

5.This instrument was used clean air as pressure media.

6.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

7.The certificate is valid only to the item calibrated on date and place of calibration.

8.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew
Issue Date : 10 January 2025

Approved Signatory : [redacted]
[ ] Phalinee Prabpaipal
[ ] Sura Suwannasri
[✓] Attapol Panurach

Result of calibration:- Without adjustment

Range : 0 mmHg to 1034 mmHg

Function:- Pressure Measurement

Resolution : 1 mmHg

Increasing Pressure

Applied Pressure (mmHg)	0.0	99.9	199.9	299.8	399.8	499.7	599.7	699.6	799.6	899.5	1033.4
UUC* Indication (mmHg)	2	102	201	301	401	501	601	701	801	901	1034
Error (mmHg)	2.0	2.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	0.6

Decreasing Pressure

Applied Pressure (mmHg)	1033.4	899.5	799.6	699.6	599.7	499.7	399.8	299.8	199.9	99.9	0.0
UUC* Indication (mmHg)	1034	900	801	701	601	501	401	301	201	102	2
Error (mmHg)	0.6	0.5	1.4	1.4	1.3	1.3	1.2	1.2	1.1	2.1	2.0

The uncertainty of measurement was ± 1.4 mmHg

* UUC = Unit Under Calibration

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

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METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24120388-2

Customer : Life and Environment Co., Ltd.
90, 92, 94 Soi On-Nuch 64, Srinakarin Rd., On-Nuch, Suanluang, Bangkok 10250

Equipment Name	:	Barometer			
Manufacturer	:	Barigo			
Model	:	N/A			
Serial Number	:	N/A			
ID. Number	:	BM-06			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 2 °C	Received Date	:	26 Dec 2024
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	13 Jan 2025
Location of Calibration	:	In-Lab	Recommend Due Date	:	13 Jan 2026
Calibration Procedure	:	SP-CPM-04-05	Date of Issue	:	14 Jan 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference prccedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : [redacted]
Calibration Officer

Approved by : [redacted]
Authorized Signatory

Calibration Report

Certificate Number : SPR24120388-2

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Absolute Pressure Module	700PA4,726	73006404	MP-0157-24	28 Jun 2025

Traceability

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

NIMT - The National Institute of Metrology, Thailand.

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สปเมทรอโลยี.com

Result of Calibration

Certificate Number : SPR24120388-2

Range : 710 to 810 mmHg(abs)

Scale Division : 1 mmHg(abs)

Measurement Function : Absolute Pressure Measurement

UUC* Accuracy ± : 1.6 %F.S.

Unit : mmHg(abs)

Direction	UUC Reading	STD Reading		Error	Uncertainty (±)
		As Found	As Left		
Increasing	730	730.5	N/A	-0.5	2.4
	740	740.6		-0.6	2.4
	750	750.6		-0.6	2.4
	760	760.7		-0.7	2.4
	770	770.5		-0.5	2.4
Decreasing	770	770.5	N/A	-0.5	2.4
	760	760.7		-0.7	2.4
	750	750.6		-0.6	2.4
	740	740.6		-0.6	2.4
	730	730.5		-0.5	2.4

Calibrated condition :

UUC* Unit Under Calibration

Conversion factor : 1 mmHg(abs) = 133.32 Pa

Mounting Position : Vertical

Reference level was center of the dial is above that of the standard and Δh = 0 m.

Note:

The result of calibration was found accurate as show on date and place of calibration only.

This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

ENTECH
Where Solutions Begin

Calibration Certificate

Certificate No: G 680020
Date of issue : 15-Jan-25

Instrument description	:	Gas Analyzer
Instrument model	:	EC 9832 Series CO
Instrument serial no.	:	13-1210
Control unit serial no.	:	-
ID no. or control no.	:	-
Manufacturer	:	Ecotech
Probe description	:	-
Probe model	:	-
Probe serial no.	:	-
Customer name	:	Life & Environment Co., Ltd. (Head Office)
Customer address	:	90,92,94 Soi On-Nuch 64, Srinakarin Road, Suanluang, Bangkok 10250
Total pages of certificate	:	2 Pages
Receiving no.	:	L-250085
Receiving date.	:	13-Jan-25
Parameter of calibration	:	Gas Calibration (Carbon Monoxide 1007 ppm)
Condition of UUC.	:	Used
Ambient condition	:	All of the Measurment ware caried out the stabilized labotary
		Temperature : 23 ±5 °C
		Humidity : 55 ± 15 %RH
Calibration place	:	17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210 THAILAND
Calibration procedure no	:	This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-19-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reporduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are tracebility to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 13-Jan-25

[redacted]
Calibration Technician

[redacted]
Technical Manager

Entech Industrial Solution Co.,Ltd.
17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210 THAILAND Tel. 0-2779-8888 Calibration@entech.co.th
Tax ID : 0105536035591 www.entech.co.th

ENTECH
Where Solutions Begin

Calibration Certificate

Certificate No.: G 680020

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Carbon monoxide (CO) 1007 ppm	1870/24	Linde	17-Jun-26

Measured room conditions

Temperature : 22.3 °C Humidity : 59.8 %RH Pressure : 1011.7 mbar

Calibration conditions

Gas Temperature : 22 °C Flow rate : 1,500 ml/min Gas pressure : 1014.2 mbar

Calibration Results (before adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
CO (ppm)	1007	1202.69	195.69	12

Calibration Results (after adjustment) (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
CO (ppm)	1007	1010.23	3.23	12

Remark : 1 µmol/mol = 1 ppm.

End of Report

Entech Industrial Solution Co.,Ltd.
17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210 THAILAND Tel. 0-2779-8888 Calibration@entech.co.th
Tax ID : 0105536035591 www.entech.co.th

ENTECH
Where Solutions Begin

Calibration Certificate

NSC-TISI-TIS 17025
CALIBRATION 0157

Certificate No: G 680024
Date of issue : 15-Jan-25

Instrument description	:	Flue Gas Analyzer
Instrument model	:	Testo 310 II
Instrument serial no.	:	64471709
Control unit serial no.	:	-
ID no. or control no.	:	-
Manufacturer	:	Testo SE & Co. KGaA
Probe description	:	-
Probe model	:	-
Probe serial no.	:	-
Customer name	:	Life & Environment Co., Ltd. (Head Office)
Customer address	:	90,92,94 Soi On-Nuch 64, Srinakarin Road, Suanluang, Bangkok 10250
Total pages of certificate	:	2 Pages
Receiving no.	:	L-250084
Receiving date.	:	13-Jan-25
Parameter of calibration	:	Gas Calibration(Oxygen 2.50,9.984,21.02 %vol, Carbon Monoxide 80.45,302,1007 ppm)
Condition of UUC.	:	Used
Ambient condition	:	All of the Measurment ware caried out the stabilized labotary
		Temperature : 23 ±5 °C
		Humidity : 55 ± 15 %RH
Calibration place	:	17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210 THAILAND
Calibration procedure no	:	This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reporduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are tracebility to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 14-Jan-25

[redacted]
Calibration Technician

[redacted]
Technical Manager

Entech Industrial Solution Co.,Ltd.
17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210 THAILAND Tel. 0-2779-8888 Calibration@entech.co.th
Tax ID : 0105536035591 www.entech.co.th

ENTECH
Where Solutions Begin

Calibration Certificate

NSC-TISI-TIS 17025
CALIBRATION 0157

Certificate No.: G 680024

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O2) 9.984 % Vol	CG-0113-24	Nimt	01-Aug-29
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.45 ppm	CG-0132-24	Nimt	10-Sep-29
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1007 ppm	1870/24	Linde	17-Jun-26

Measured room conditions

Temperature : 22.6 °C Humidity : 62.4 %RH Pressure : 1011.8 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 700 ml/min Gas pressure : 1013.9 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.50	2.5	0.00	0.15
O2 (%Vol)	9.984	10.2	0.216	0.23
O2 (%Vol)	21.02	21.2	0.18	0.30
CO (ppm)	80.45	82	1.55	3.2
CO (ppm)	302	312	10	12
CO (ppm)	1007	1036	29	35

Remark : 1 cmol/mol = 1 %vol. 1 µmol/mol = 1 ppm.

End of Report

Entech Industrial Solution Co.,Ltd.
17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210 THAILAND Tel. 0-2779-8888 Calibration@entech.co.th
Tax ID : 0105536035591 www.entech.co.th

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484

ilac-MRA

NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Cert.No.: 25CH29
Page.: 1 of 2

Equipment :	pH Meter
Manufacturer :	Hanna
Model :	HI 3222
Serial No. :	08645111
ID No. :	-
Condition As-Received:	Used Item
Received Date :	03 January 2025
Calibration Date :	10 January 2025
Reference :	2501-0065WN-1
Submitted by :	LIFE & ENVIRONMENT CO., LTD. 90, 92, 94 Soi On-Nuch 64, Srinakarin Road, On-Nuch, Suanluang, Bangkok 10250
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
Calibrated by :	[redacted]
Approved by :	Approved Signatory

( ) Pornthippa Tameyakul
( ) Ponpan Paipim
(✓) [redacted]

Issue Date : 10 January 2025

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1)Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025

- This Certification is traceable to SI Throught Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :The measurement results are traceable to SI through Hach Lenge GmbH Ltd., Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
:The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 7.000	Hach Lenge GmbH	C03185	09 July 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor *k*
	pH	mV	mV	pH		
pH Meter	4.000	177.48	177.3	4.000	0.058	2.00
S/N.: 08645111	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor *k*
pH Electrode	4.008	4.008	174.1	0.0045	2.00
S/N.: 092818FN	7.000	7.001	-0.3	0.0084	2.00
	10.010	10.008	-174.5	0.0068	2.00

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

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NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	Cooled Incubator	Certificate No.:	C31252398
Manufacturer:	Accuplus	Issued Date:	05 November 2025
Model:	i250	Job No.:	WO-00092325
Serial No.:	0812-0416	Ventilation Valve:	None
ID No.:	W-BOD-01/55	Page:	1 of 3
Shelves(pc.):	2		
Condition of the item:	Normal		

Customer: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Environment Condition:

Temperature:	21 °C	±	2.0	°C
Relative Humidity:	51 %	±	5.2	%
Voltage:	229 VAC	±	2.0	VAC

Calibration Place: LIFE & ENVIRONMENT CO., LTD. (Water & Soil Testing Laboratory)
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Calibration By: Mr. Tweewong Thaithiang

Calibration Date: 05 November 2025

The Method Used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10250009

[redacted]
Person in charge

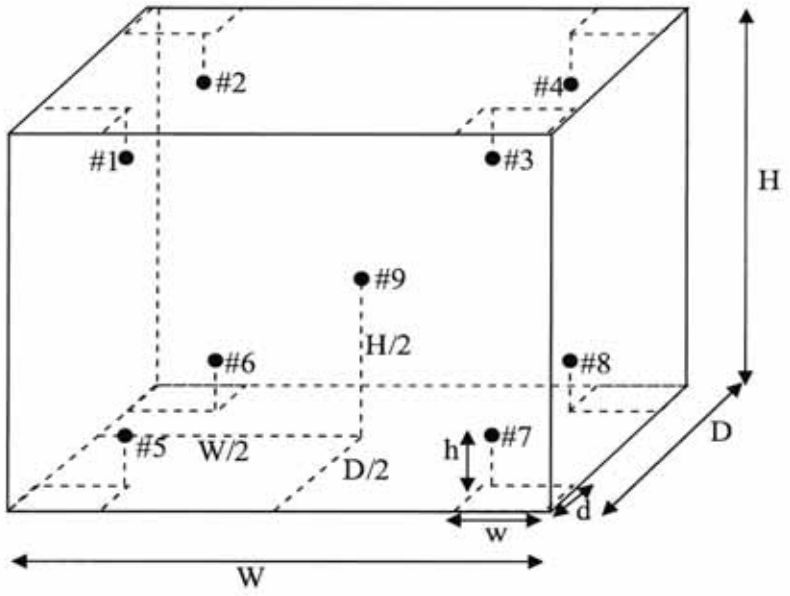
[redacted]
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand



Standard Installation Locations

Volume (Calibration Zone)= 102 (Liters)

Inside chamber:	W = 50 (cm)	D = 50 (cm)	H = 104 (cm)
Standard Locations (#1, #2, #3, #4):	w = 5 (cm)	d = 5 (cm)	h = 30 (cm)
Standard Locations (#5, #6, #7, #8):	w = 5 (cm)	d = 5 (cm)	h = 10 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

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

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.18	0.18	0.35
#2	20.24	0.24	0.32
#3	20.11	0.11	0.38
#4	20.20	0.20	0.40
#5	20.17	0.17	0.32
#6	20.26	0.26	0.29
#7	20.11	0.11	0.34
#8	20.10	0.10	0.34
#9	20.12	0.12	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.0	20.0	20.18	20.24	20.11	20.20	20.17	20.26	20.11	20.10	20.12	0.40

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.31	0.30	0.67

Note: * Maximum uncertainty of the each position

The End of Certificate

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Certificate of Calibration

NSC-TISI-TIS 17025
Calibration 0087

Equipment:	Incubator	Certificate No.:	C31252397
Manufacturer:	Memmert	Issued Date:	05 November 2025
Model:	INE 400	Job No.:	WO-00092325
Serial No.:	E407.1277	Ventilation Valve:	Closed
ID No.:	WM-IB-02/51	Page:	1 of 3
Shelves(pc.):	1		
Condition of the item:	Normal		

Customer: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Environment Condition:

Temperature:	25 °C	±	0.7	°C
Relative Humidity:	60 %	±	4.4	%
Voltage:	228 VAC	±	1.5	VAC

Calibration Place: LIFE & ENVIRONMENT CO., LTD. (Microbiological Laboratory)
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 05 November 2025

The Method Used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10250016

[redacted]
Person in charge

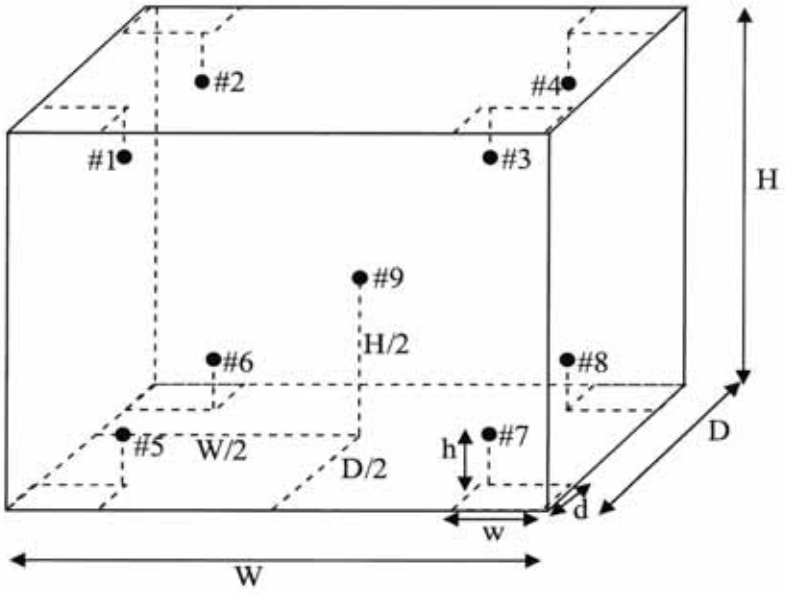
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Authorized signatory

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The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).

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Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber:	W = 40 (cm)	D = 33 (cm)	H = 40 (cm)
Standard Locations (#1, #2, #3, #4):	w = 5 (cm)	d = 5 (cm)	h = 5 (cm)
Standard Locations (#5, #6, #7, #8):	w = 5 (cm)	d = 5 (cm)	h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

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

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 35.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	35.03	0.03	0.23
#2	35.06	0.06	0.23
#3	35.07	0.07	0.23
#4	35.14	0.14	0.23
#5	35.17	0.17	0.24
#6	35.26	0.26	0.24
#7	35.28	0.28	0.24
#8	35.54	0.54	0.24
#9	35.50	0.50	0.24

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
35.0	35.0	35.0	35.03	35.06	35.07	35.14	35.17	35.26	35.28	35.54	35.50	0.24

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
35.0	0.53	0.07	0.58

Note: * Maximum uncertainty of the each position

The End of Certificate

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Certificate of Calibration

NSC-TISI-TIS 17025
Calibration 0087

Equipment:	Cooled Incubator	Certificate No.:	C31252396
Manufacturer:	Accuplus	Issued Date:	05 November 2025
Model:	i250	Job No.:	WO-00092325
Serial No.:	0812-0414	Ventilation Valve:	None
ID No.:	W-RE-01/55	Page:	1 of 3
Shelves(pc.):	2		
Condition of the item:	Normal		

Customer: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Environment Condition:

Temperature:	21 °C	±	1.9	°C
Relative Humidity:	51 %	±	5.2	%
Voltage:	229 VAC	±	2.0	VAC

Calibration Place: LIFE & ENVIRONMENT CO., LTD. (Water & Soil Testing Laboratory)
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Calibration By: Mr. Tweewong Thaithiang

Calibration Date: 05 November 2025

The Method Used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10250009

[redacted]

Person in charge

[redacted]

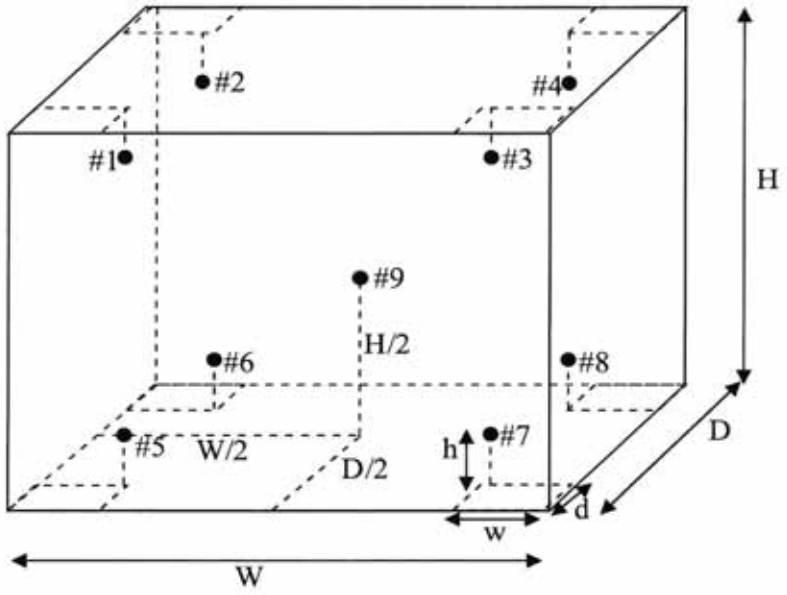
Authorized signatory

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Standard Installation Locations

Volume (Calibration Zone)= 102 (Liters)

Inside chamber:	W = 50 (cm)	D = 50 (cm)	H = 104 (cm)
Standard Locations (#1, #2, #3, #4):	w = 5 (cm)	d = 5 (cm)	h = 30 (cm)
Standard Locations (#5, #6, #7, #8):	w = 5 (cm)	d = 5 (cm)	h = 10 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	201	202	203	204	205	206	207	208	209

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

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

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 4.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	3.73	-0.27	0.87
#2	3.63	-0.37	1.02
#3	4.04	0.04	0.72
#4	4.08	0.08	0.81
#5	4.26	0.26	0.55
#6	3.89	-0.11	0.70
#7	3.98	-0.02	0.65
#8	3.90	-0.10	0.66
#9	3.64	-0.36	0.89

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
4.0	4.0	4.0	3.73	3.63	4.04	4.08	4.26	3.89	3.98	3.90	3.64	1.02

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
4.0	1.03	0.84	1.89

Note: * Maximum uncertainty of the each position

The End of Certificate

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DKSH

NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	Liquid Bath	Certificate No.:	C13250417
Manufacturer:	GLF	Issued Date:	05 November 2025
Model:	1013	Job No.:	WO-00092325
Serial No.:	10637804J	Page:	1 of 3
ID No.:	WM-WB-01/05		
Forced Circulation:	None		
Condition of the item:	Normal		

Customer: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Environment Condition:

Temperature:	27 °C	±	0.1 °C
Relative Humidity:	60 %	±	4.3 %
Voltage:	228 VAC	±	1.4 VAC

Calibration Place: LIFE & ENVIRONMENT CO., LTD. (Microbiological Laboratory)
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 05 November 2025

The Method Used: In house method, CAL-WI-17, base on ASTM E715-80

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10250016

[redacted]
Person in charge

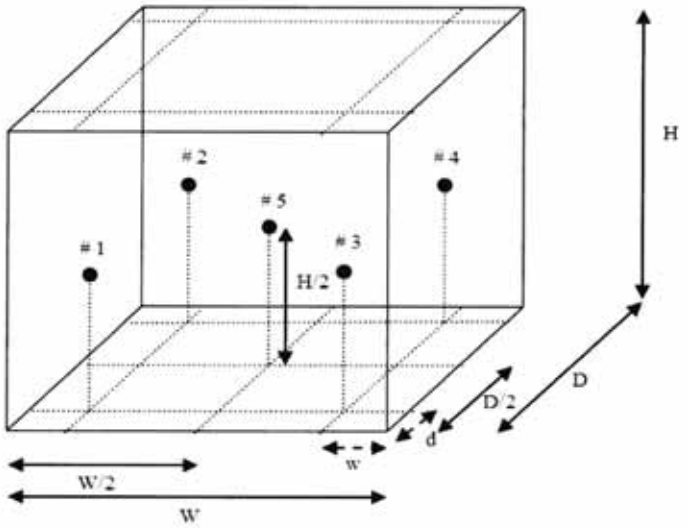
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Authorized signatory

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Standard Installation Locations

Midway between the diffuser plate and the water surface

Inside bath:	W =	40	(cm)	D =	25	(cm)	H = 17	(cm)	Volume = 17 (Liters)
Standard Locations #1:				w =	5	(cm)	d = 5	(cm)	
Standard Locations #2:				w =	5	(cm)	d = 5	(cm)	
Standard Locations #3:				w =	5	(cm)	d = 5	(cm)	
Standard Locations #4:				w =	5	(cm)	d = 5	(cm)	

Standard Locations #5: Center of any probes. (#1 - #4)

Position of Std	#1	#2	#3	#4	#5
Channel of Logger	201	202	203	204	205

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the bath.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the bath at steady-state. The reference probe is preferably located in the geometric center of the bath.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

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

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 44.5 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	44.49	-0.01	0.15
#2	44.50	0.00	0.15
#3	44.49	-0.01	0.15
#4	44.48	-0.02	0.15
#5	44.48	-0.02	0.16

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)					Uncertainty (± °C)*
			#1	#2	#3	#4	#5	
44.5	44.5	44.5	44.49	44.50	44.49	44.48	44.48	0.16

Bath Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
44.5	0.02	0.02	0.04

Note: * Maximum uncertainty of the each position

The End of Certificate

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DKSH

NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	Autoclave	Certificate No.:	C11250330
Manufacturer:	ALP	Issued Date:	10 December 2025
Model:	88	Job No.:	WO-00097669
Serial No.:	105611	Page:	1 of 3
ID No.:	-		
Condition of the item:	Normal		

Customer: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Environment Condition:

Temperature:	24 °C	±	0.5 °C
Relative Humidity:	56 %	±	4.9 %
Voltage:	225 VAC	±	1.1 VAC

Calibration Place: LIFE & ENVIRONMENT CO., LTD. (Microbiogy Testing Laboratory)
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 10 December 2025

The Method Used: In house method, CAL-WI-18, base on BS 2646 : Part 5

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Quality reborn Co., Ltd.
Certificate No.QR24-3470

[redacted]
Person in charge

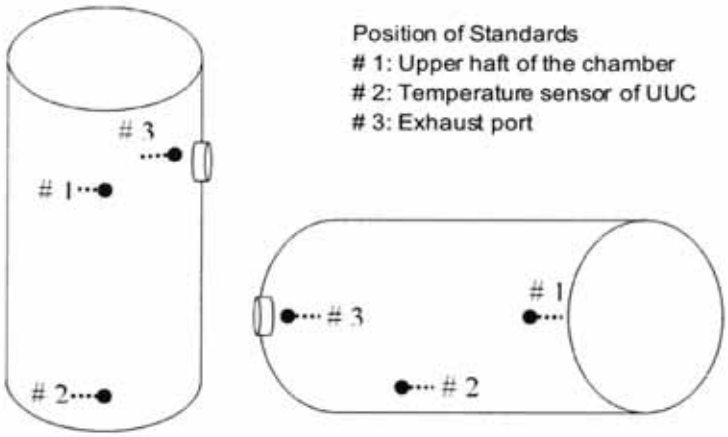
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☑ ☐

Standard Installation Locations

Standard Locations (#1): Upper haft of the chamber

Standard Locations (#2): Distance from temperature sensor of UUC 2 (cm.)

Standard Locations (#3): Distance from the wall 5 (cm.)

Position of Std	#1	#2	#3
Channel of Logger	13	14	15

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 121.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	121.25	0.25	0.35
#2	121.18	0.18	0.35
#3	121.24	0.24	0.35

Temperature Distribution

Temperature			Pressure	Measured Temperature at Spread Locations			Uncertainty
Desired (°C)	Setting (°C)	Indicating (°C)	Indicating kg/cm²	#1 (°C)	#2 (°C)	#3 (°C)	(± °C)*
121.0	121.0	121.0	1.2	121.25	121.18	121.24	0.35

Chamber Characterization

Indicating Temperature (°C)	Indicating Pressure kg/cm²	Measured Stability (± °C)
121.0	1.2	0.10

Note: * Maximum uncertainty of the each position

Record every 10 seconds after reaching steady state or after one achieved complete cycle.

The End of Certificate

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NSC-TISI-TIS 17025
Calibration 0087

Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31251175
Model:	UFE 400	Issued Date:	16 May 2025
Serial No.(or ID):	G412.0022	Job No.:	WO-00069866
Manufacturer:	Memmert	Page:	1 of 5
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	1		

Customer: LIFE & ENVIRONMENT CO., LTD.
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Environment Condition:

Temperature:	26 °C	±	1.1	°C
Humidity:	57 %RH	±	5.5	%RH
Voltage:	230 VAC	±	1.7	VAC

Calibration Place: LIFE & ENVIRONMENT CO., LTD. (Water & Soil Testing Laboratory)
90, 92, 94 Soi On-nuch 64, Srinakarin Road, On-nuch,
Suanluang, Bangkok 10250 Thailand

Calibration By: Mr. Achitphol seejam

Calibration Date: 16 May 2025

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10240017

[redacted]
Person in charge

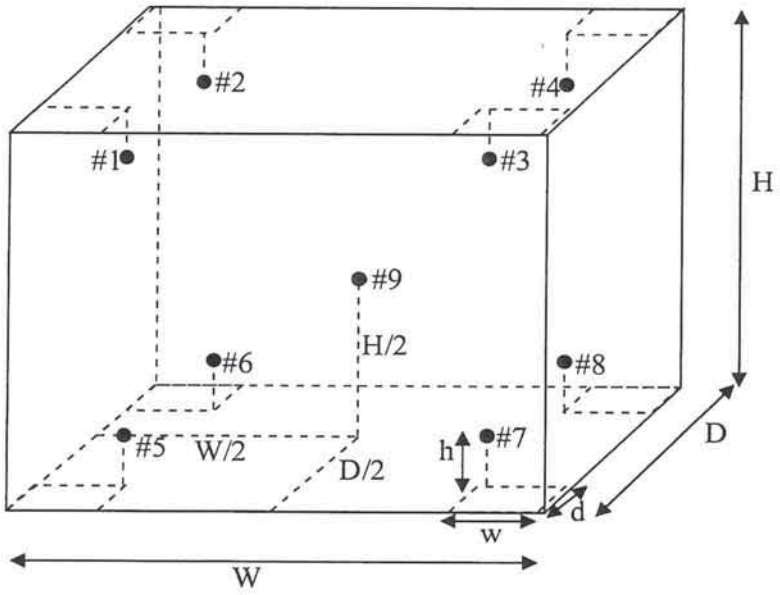
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Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber:	W = 40 (cm)	D = 33 (cm)	H = 40 (cm)
Standard Locations (#1, #2, #3, #4):	w = 5 (cm)	d = 5 (cm)	h = 5 (cm)
Standard Locations (#5, #6, #7, #8):	w = 5 (cm)	d = 5 (cm)	h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

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

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.16	0.16	0.39
#2	104.21	0.21	0.39
#3	103.72	-0.28	0.39
#4	104.29	0.29	0.39
#5	104.13	0.13	0.39
#6	103.71	-0.29	0.39
#7	103.75	-0.25	0.39
#8	103.77	-0.23	0.39
#9	104.18	0.18	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.16	104.21	103.72	104.29	104.13	103.71	103.75	103.77	104.18	0.39

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.49	0.04	0.62

Note: * Maximum uncertainty of the each position

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Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 150.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	150.26	0.26	0.39
#2	150.47	0.47	0.39
#3	149.45	-0.55	0.39
#4	150.21	0.21	0.39
#5	150.49	0.49	0.39
#6	149.58	-0.42	0.39
#7	149.73	-0.27	0.39
#8	149.80	-0.20	0.39
#9	150.29	0.29	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
150.0	150.0	150.0	150.26	150.47	149.45	150.21	150.49	149.58	149.73	149.80	150.29	0.39

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
150.0	0.89	0.05	1.12

Note: * Maximum uncertainty of the each position

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.18	0.18	0.42
#2	180.60	0.60	0.42
#3	179.28	-0.72	0.42
#4	179.87	-0.13	0.42
#5	180.84	0.84	0.42
#6	179.49	-0.51	0.42
#7	179.80	-0.20	0.42
#8	179.84	-0.16	0.42
#9	180.44	0.44	0.42

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.18	180.60	179.28	179.87	180.84	179.49	179.80	179.84	180.44	0.42

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.20	0.05	1.61

Note: * Maximum uncertainty of the each position

The End of Certificate

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

บริษัท ปิ่นทองกรุ๊ป แมนเนจเม้นท์ แอนด์ คอนซัลแตนท์ จำกัด
PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO.,LTD
27 ถนนพระรามที่ 2 แขวงท่าข้าม เขตบางขุนเทียน กรุงเทพมหานคร 10150
Tel. 02-416-9779 (12 คู่สาย) Fax 02- 417-0154-9 www.pinthong-group.com E-mail : pmc@pinthong-group.com

Calibration Test Report

Calibrated at : บริษัท ไทยชินกง อินดัสตรี คอร์ปอเรชั่น จำกัด
Reference Standard : Sound Calibrator Class 1 Model QC-10
Serial No.QIG030022
Date of Calibration : 07/5/2024

Date	Serial No.	Reference Standard (dB)	Insrument Reading (dB)	Adjust	Error (dB)	After Use	Error (dB)	Inspection Result	Calibrated By
19/7/2567	112033	114.0	114.0	114.0	0.0	114.0	0.0	Pass	พิทักษ์ธรรม ต.
19/7/2567	820752	114.0	114.0	114.0	0.0	114.0	0.0	Pass	พิทักษ์ธรรม ต.
19/7/2567	820755	114.0	114.0	114.0	0.0	114.0	0.0	Pass	พิทักษ์ธรรม ต.
19/7/2567	820756	114.0	114.0	114.0	0.0	114.0	0.0	Pass	พิทักษ์ธรรม ต.

หมายเหตุ : **Error ± 1.5 dB**

P.M.C. PINTHONG GROUP

Approve By : [redacted]

Date : .....19.../....ก.ค.../... 2567...

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WK Electric Co.,Ltd.
68/242 Moo 5, Sawaipracharaj Rd., Tumbol Ladsawai, Amphur Lamlukka, Pathumthani 12150
Tel. +66 2993 4773, +66 2153 7132-3 Fax. +66 2994 5509 E-mail : wk.calibrations@gmail.com www.wk-etc.com

Certificate of Calibration

Certificate No. : WK2405-033-1

Customer : Pinthong Group Management and Consultants Co.,Ltd.
27 Rama 2 Road, Thakham,
Bangkuntien, Bangkok, 10150, Thailand.

Instrument	: Calibrator	Ambient Temperature	: (23 ± 2)°C
Manufacturer	: Quest Technologies	Humidity	: (50 ±15) %RH
Model	: QC-10	Received Date	: 3-May-24
Serial No.	: QIG030022	Calibrated Date	: 7-May-24
Identity No.	: N/A	Issued Date	: 8-May-24
Range	: See to Data	Calibrated Location	: In Lab
Resolution	: See to Data		

Calibration Method : CP-WK-A02, CP-WK-TF03, CP-WK-E19

Reference Standard Instruments :

Instrument	Serial No.	Certificate No.	Due Date	Traceability to
Data Acquisition/Switch Unit	MY41011202	WK2401-049-1	5-Jan-25	WK Electric Co.,Ltd
Sound Level Calibrator	10049416	EEL.BP.196/0166	27-Jan-25	TISTR
Universal Counter	3416A08501	TTH-0-89055	19-Feb-26	Techmaster
Audio Analyzer	3413A14479	E3U2400174	13-Feb-26	NA

TISTR : Thailand Institute of Scientific and Technological Research.
Techmaster : Techmaster Asia (Thailand) Co., Ltd.
NA : NA Caltechnologies., Ltd.
This result calibrate was found accurate as shown on date place of calibrate only
This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr.Kritsada Ouparattha

Approved by : [redacted]

Authorized Signatory

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Calibration Results

Certificate No.: WK2405-033-1

Calibration Results

Function : Sound Level Pressure Measurement @ 1kHz

Nominal Value (dB)	STD Value (dB)	Error (dB)	(±) Uncertainty (dB)
94	113.97	0.03	0.061

Function : Frequency Measurement

Nominal Value (Hz)	STD Value (Hz)	Error (Hz)	(±) Uncertainty (Hz)
1000	1000.023	-0.023	0.58

(X) Without Adjustment ( ) After Adjustment

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**** End of Certificate****

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Certificate of Calibration

Certificate No.: WK2403-103-2

Customer : PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO.,LTD.
27 Rama 2 Road, Thakham, Bangkuntien,
Bangkok 10150 Thailand

Instrument	: Sound Level Meter	Ambient Temperature	: (23 ± 2) °C
Manufacturer	: N/A	Humidity	: (50 ±15) %RH
Model	: TYPE 6236	Received Date	: 11-Mar-24
Serial No.	: 112033	Calibrated Date	: 12-Mar-24
Identity No.	: N/A	Issued Date	: 18-Mar-24
Range	: See to Data	Calibrated Location	: In Lab
Resolution	: 0.1 dB		
Calibration Method	: CP-WK-A01		

Reference standard instruments :

Instrument	Serial No.	Certificate No.	Due Date	Traceability to
Sound Level Calibrator	10049416	EEL.BP. 196/0166	27-Jan-25	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.
This result calibrate was found accurate as shown on date place of calibrate only
This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Chanwit Phumiphaksuwan

Approved by : [redacted]cha
Authorized Signatory

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Calibration Results

Certificate No. : WK2403-103-2

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.2	0.2	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	93.9	-0.1	0.20
114	114.2	0.2	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.2	0.2	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	93.9	-0.1	0.20
114	114.2	0.2	0.20

(X) Without Adjustment ( ) After Adjustment

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Certificate of Calibration

Certificate No.: WK2405-033-2 Page 1 of 2

Customer : Pinthong Group Management and Consultants Co.,Ltd.
27 Rama 2 Road, Thakham,
Bangkuntien, Bangkok, 10150, Thailand.

Instrument	: Sound Level Meter	Ambient Temperature	: (23 ± 2) °C
Manufacturer	: Scarlet Tech	Humidity	: (50 ±15)%RH
Model	: ST 21D	Received Date	: 3-May-24
Serial No.	: 820752	Calibrated Date	: 7-May-24
Identity No.	: N/A	Issued Date	: 8-May-24
Range	: See to Data	Calibrated Location	: In Lab
Resolution	: 0.1 dB		

Calibration Method : CP-WK-A01

Reference standard instruments :

Instrument	Serial No.	Certificate No.	Due Date	Traceability to
Sound Level Calibrator	10049416	EEL.BP. 196/0166	27-Jan-25	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.
This result calibrate was found accurate as shown on date place of calibrate only
This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Kritsada Ouparattha Approved by : [redacted]

Authorized Signatory

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Calibration Results

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	113.9	-0.1	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	113.9	-0.1	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	113.9	-0.1	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	113.9	-0.1	0.20

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Certificate of Calibration

Certificate No.: WK2405-033-4

Customer : Pinthong Group Management and Consultants Co.,Ltd.
27 Rama 2 Road, Thakham,
Bangkuntien, Bangkok, 10150, Thailand.

Instrument	: Sound Level Meter	Ambient Temperature	: (23 ± 2) °C
Manufacturer	: Scarlet Tech	Humidity	: (50 ±15)%RH
Model	: ST 21D	Received Date	: 3-May-24
Serial No.	: 820755	Calibrated Date	: 7-May-24
Identity No.	: N/A	Issued Date	: 8-May-24
Range	: See to Data	Calibrated Location	: In Lab
Resolution	: 0.1 dB		

Calibration Method : CP-WK-A01

Reference standard instruments :

Instrument	Serial No.	Certificate No.	Due Date	Traceability to
Sound Level Calibrator	10049416	EEL.BP. 196/0166	27-Jan-25	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.
This result calibrate was found accurate as shown on date place of calibrate only
This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Kritsada Ouparattha

Approved by : [redacted]

Authorized Signatory

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Calibration Results

Certificate No. : WK2405-033-4

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.0	0.0	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.0	0.0	0.20

(X) Without Adjustment ( ) After Adjustment

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**** End of Certificate****

WK Electric Co.,Ltd.
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Certificate of Calibration

Certificate No.: WK2405-033-5

Customer : Pinthong Group Management and Consultants Co.,Ltd.
27 Rama 2 Road, Thakham,
Bangkuntien, Bangkok, 10150, Thailand.

Instrument	: Sound Level Meter	Ambient Temperature	: (23 ± 2) °C
Manufacturer	: Scarlet Tech	Humidity	: (50 ±15)%RH
Model	: ST 21D	Received Date	: 3-May-24
Serial No.	: 820756	Calibrated Date	: 7-May-24
Identity No.	: N/A	Issued Date	: 8-May-24
Range	: See to Data	Calibrated Location	: In Lab
Resolution	: 0.1 dB		

Calibration Method : CP-WK-A01

Reference standard instruments :

Instrument	Serial No.	Certificate No.	Due Date	Traceability to
Sound Level Calibrator	10049416	EEL.BP. 196/0166	27-Jan-25	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.
This result calibrate was found accurate as shown on date place of calibrate only
This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Kritsada Ouparattha Approved by : [redacted]

Authorized Signatory

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Calibration Results

Certificate No. : WK2405-033-5

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.0	0.0	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.0	0.0	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	113.9	-0.1	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	113.9	-0.1	0.20

(X) Without Adjustment ( ) After Adjustment

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**** End of Certificate****

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Cert.No.: 25CH847
Page.: 1 of 3

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	SevenCompact S220
Serial No. :	C104059460
ID No. :	RYG_EN0183
Condition As-Received:	Used Item
Received Date :	17 July 2025
Calibration Date :	18 July 2025
Reference :	2507-0561DSC-3
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch 616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with temperature standard

REVIEW BY ..[redacted]
APPROVED BY.....
NEXT CAL DATE.....18/01/27.....

Calibrated by : [redacted]

Approved by :

( ) Chakrit Waewwanjua
( ) Ponpan Paipim
(✓) [redacted]

Issue Date : 21 July 2025

The Uncertainties are for a confidence probability of approximately 95%

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Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	3240076	60RC033	25I394	01 Apr 2026

- This measurement result is traceable to SI throught Technology Promotion Association (Thailand - Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1114385	08 June 2026

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor *k*
	pH	mV	mV	pH		
pH Meter	4.000	177.48	177.3	4.000	0.058	2.00
S/N.: C104059460	7.000	0.00	-0.2	7.000	0.058	2.00
	10.000	-177.48	-177.6	10.000	0.058	2.00

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor *k*
pH Electrode	4.007	4.008	184.6	0.0044	2.00
S/N.: 5240606	6.965	6.966	10.2	0.0084	2.00
	10.010	10.009	-164.9	0.0065	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Pro-ISM
- Serial No. : 5240606

Dimension of probe

- Length : 120 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor *k*
25.0	25.001	25.0	-0.001	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

-o0o-

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Certificate No. : 25E2372

Equipment :	pH Meter
Manufacturer:	Mettler Toledo
Model :	SevenCompact S220
Serial No.:	C104059460
ID No.:	RYG_EN0183
Condition As-Received:	Used Item
Received Date:	17 July 2025
Calibration Date:	22 July 2025
Reference:	2507-0561DSC
Ambient Temperature:	(23 ± 2) °C
Relative Humidity:	(50 ± 10) %

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Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch

616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand

Procedure used: Calibration were conducted using calibration procedure No. CP-E17 according to EURAMET cg-15.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6315011	25E1627	19 May 2026

2.This result of calibration was made on requested at the point specified by customer.

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

4.This measurement result is traceable to the International System of Unit maintained through:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : [redacted]
Issue Date : 23 July 2025

Approved Signatory : [redacted]
[ ] Phalinee Prabpaipal
[ ] Nuntawat Khamchai
[redacted]

Result of calibration :- (*) Without adjustment ( ) After adjustment

Function: DC voltage measurement **Range:** 2000 mV

Standard Value	UUC* Reading	Error	Uncertainty
(mV)	(mV)	(mV)	(± µV)
-200.0000	-200.0	0.0	68
-150.0000	-150.0	0.0	65
-100.0000	-100.0	0.0	63
-50.0000	-50.0	0.0	61
0.0000	0.0	0.0	58
50.0000	49.9	-0.1	61
100.0000	99.9	-0.1	63
150.0000	149.9	-0.1	65
200.0000	199.9	-0.1	68

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

UUC* = Unit Under Calibration.

-o0o-

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID:	BKK_EN0059(GM-7)
Organization Name:	ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location:	104 Patthanakarn 40, Patthanakarn Rd., Khwang Suan Luang, Khet Suan Luang, Bangkok
Date:	June 25, 2025 8:40:18 PM
EQP Name:	AgilentRecommended , AgilentRecommended
EQP Revision:	GC.02.50, GCMS.02.50
Overall Qualification Status:	Pass

REVIEW BY [redacted]

APPROVED

NEXT CAL. DATE 25-Dec-26

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	25.2	psi

Accuracy: 0.2 psi

Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name:	7890					
Setpoint Status:	**Pass**					
Zone:	Oven					
	Setpoint/Actual					
Temperature:	230.0		228.8	°C		
Accuracy:			-1.2	°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		100.8	°C		
Accuracy:			0.8	°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		101.0	°C
Stability:			0.0	°C
Agilent Recommended:		<=	0.5	

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977A			

Date: June 25, 2025 8:40:18 PM
System ID: BKK_EN0059(GM-7)

Setpoint Status: **Pass**

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1	Front	SSL	/ External	SQ	
Name:	5977A				

Setpoint Status: **Pass**

Amu:	1050	m/z	Drift After Five Minutes:					RFPA Voltage:	
			2	mV				462	mV
Agilent Recommended:			>=	-100	and	<=	100	<=	1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1	Front	SSL	/ External	SQ	
Name:	5977A				

Setpoint Status: **Pass**

Filament: 1

Setpoint Status: **Pass**

Filament: 2

Overall Tune EI Test Status

Pass

Signal to Noise EI

Tested Combination1	Front	SSL	/ External	SQ	
Name:	5977A				

Source:	EI - Extractor	Filament:	1

Setpoint Status: **Pass**

Signal to Noise:		35794093956
Agilent Recommended:	>=	1200

Source:	EI - Extractor	Filament:	2

Setpoint Status: **Pass**

Signal to Noise:		32894968229
Agilent Recommended:	>=	1200

Overall Signal to Noise EI Test Status

Pass

NOTE: This test's 0 comment(s) and 3 deviation(s) are available in the Attachments section.

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System	
System ID	BKK_EN0059(GM-7)
Manufacturer	Agilent Technologies
Name	7890
Tested Combination1	
Injection Technique	Manual Injection
Inlet	Front
Detector	External
LTM Included?	No
Sampler 1	
Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10
Mainframe 1	
Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN14133181
Firmware Revision	B.02.03
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	5977A
Serial Number	US1415M209
Firmware Revision	5977 6.00.21
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

MS EI Source 1

Manufacturer	Agilent Technologies
Source Type	EI - Extractor
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:	[redacted]
Logged On User Name:	
Signature Creation Date:	June 25, 2025
Reason for Signature:	Executed protocol and published this original version of document

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

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: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 13, 2025 10:01:23 AM	Audit	SessionCreated	Session	Host Name: 5CG1115HKC, Drive Serial Number: C2031778
June 13, 2025 10:01:24 AM	start	Configuration	Session	None
June 13, 2025 10:01:24 AM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
June 13, 2025 10:04:40 AM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.50/Gc.02.50.eqp], EQP File Name: [Gc.02.50.eqp], EQP Name: [AgilentRecommended],Protocol Revision :[Gc.02.50] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.50/GcMs.02.50.eqp], EQP File Name: [GcMs.02.50.eqp], EQP Name: [AgilentRecommended]
June 13, 2025 10:04:51 AM	End	Configuration	Session	None
June 13, 2025 10:05:03 AM	start	Qualification	Session	OQ
June 13, 2025 10:05:05 AM	start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
June 13, 2025 10:05:35 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1

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User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 13, 2025 10:06:49 AM	start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
June 13, 2025 10:06:58 AM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
June 13, 2025 10:07:00 AM	start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
June 13, 2025 10:07:30 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
June 13, 2025 10:07:35 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
June 13, 2025 10:07:59 AM	start	Execution	RFPA - 5977A SQ: - Source: EI - Extractor	None
June 13, 2025 10:11:14 AM	start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
June 13, 2025 10:12:12 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
June 13, 2025 10:12:17 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

User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 13, 2025 10:12:19 AM	start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
June 13, 2025 10:30:39 AM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
June 13, 2025 10:30:45 AM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
June 13, 2025 10:30:56 AM	start	Execution	Log Amp - 5977A SQ: - Source: EI - Extractor	None
June 13, 2025 10:31:15 AM	End	Execution	Log Amp - 5977A SQ: - Source: EI - Extractor	Run Count : 1
June 13, 2025 10:34:14 AM	Audit	AceClosed	Session	None
June 16, 2025 11:55:53 AM	Audit	AceRestarted	Session	Host Name: DESKTOP-6PKI2AL, Drive Serial Number: 9494EA83
June 16, 2025 11:55:55 AM	Audit	SessionReloaded	Session	None
June 16, 2025 11:58:07 AM	start	Qualification	Session	OQ
June 16, 2025 5:47:31 PM	Audit	AceClosed	Session	None
June 17, 2025 1:34:47 PM	Audit	AceRestarted	Session	Host Name: DESKTOP-6PKI2AL, Drive Serial Number: 9494EA83
June 17, 2025 1:39:58 PM	Audit	AceClosed	Session	None
June 17, 2025 1:52:55 PM	Audit	AceRestarted	Session	Host Name: DESKTOP-6PKI2AL, Drive Serial Number: 9494EA83
June 17, 2025 2:03:56 PM	Audit	SessionReloaded	Session	None
June 17, 2025 2:03:58 PM	start	Qualification	Session	OQ
June 17, 2025 2:04:08 PM	Audit	AceClosed	Session	None

User Name: supasak.nimaongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 25, 2025 3:07:51 PM	Audit	AceRestarted	Session	Host Name: 5CG1115HKC, Drive Serial Number: C2031778
June 25, 2025 3:07:54 PM	Audit	SessionReloaded	Session	None
June 25, 2025 3:09:13 PM	start	Qualification	Session	OQ
June 25, 2025 3:09:36 PM	start	Execution	RFPA - 5977A SQ: - Source: EI - Extractor	None
June 25, 2025 3:10:29 PM	End	Execution	RFPA - 5977A SQ: - Source: EI - Extractor	Run Count : 1
June 25, 2025 3:10:35 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	None
June 25, 2025 3:10:40 PM	start	Execution	Tune EI - 5977A SQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
June 25, 2025 4:10:20 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	None
June 25, 2025 4:10:23 PM	start	Execution	Tune EI - 5977A SQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
June 25, 2025 4:10:43 PM	End	Execution	Tune EI - 5977A SQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
June 25, 2025 4:10:45 PM	start	Execution	Tune EI - 5977A SQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None

User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 25, 2025 4:11:08 PM	End	Execution	Tune EI - 5977A SQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated)	Run Count : 1
June 25, 2025 4:11:11 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	None
June 25, 2025 4:30:52 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	None
June 25, 2025 5:23:59 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F1_001.D
June 25, 2025 5:24:19 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
June 25, 2025 5:26:41 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F1_001.D
June 25, 2025 5:27:28 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 20000;Integration: Off at 0;Integration: On at 4]

User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 25, 2025 5:29:45 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	Run Count : 1
June 25, 2025 5:31:32 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	Deviation filed for Run Count : 1
June 25, 2025 5:31:32 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	None
June 25, 2025 5:34:18 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F1_001.D
June 25, 2025 5:35:03 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
June 25, 2025 5:37:01 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F1_001.D
June 25, 2025 5:37:47 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 25000;Integration: OFF at 0;Integration: ON at 4]

User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional information
June 25, 2025 5:40:08 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	Run Count : 2
June 25, 2025 5:41:09 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	None
June 25, 2025 5:44:37 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F2_001.D
June 25, 2025 5:48:28 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Run Count : 1
June 25, 2025 5:49:39 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Deviation filed for Run Count : 1
June 25, 2025 5:49:40 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	None
June 25, 2025 5:57:10 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F2_001.D
June 25, 2025 5:57:46 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over

User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 25, 2025 5:59:51 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F2_001.D
June 25, 2025 6:00:02 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
June 25, 2025 6:02:07 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F2_001.D
June 25, 2025 6:02:24 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
June 25, 2025 6:19:36 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
June 25, 2025 6:27:38 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Data files Path : C:\Users\imsongth\Downloads\OQ data\OQ data\OQ_SN_F2_002.D
June 25, 2025 6:33:07 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Run Count : 2
June 25, 2025 6:34:17 PM	Audit	TestUnlocked	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Deviation filed for Run Count : 2
June 25, 2025 6:34:17 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	None

User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: BKK_EN0059(GM-7)
Print Date: June 25, 2025 8:40:20 PM

GM-7-2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 25, 2025 6:35:07 PM	Audit	AceClosed	Session	None
June 25, 2025 6:35:57 PM	Audit	AceRestarted	Session	Host Name: 5CG1115HKC, Drive Serial Number: C2031778
June 25, 2025 6:35:59 PM	Audit	SessionReloaded	Session	None
June 25, 2025 6:36:12 PM	start	Qualification	Session	OQ
June 25, 2025 6:36:13 PM	start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	None
June 25, 2025 6:39:41 PM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Data files Path : C:\Users\limsongth\Downloads\OQ data\OQ data\OQ_SN_F2_002.D
June 25, 2025 6:42:57 PM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 2 - L: >= 1200	Run Count : 3
June 25, 2025 6:43:11 PM	End	Qualification	Session	OQ
June 25, 2025 6:43:11 PM	start	Reporting	Session	None
June 25, 2025 8:04:02 PM	Audit	Reporting	Session	Report Generated : Certificate
June 25, 2025 8:32:04 PM	Audit	Reporting	Session	Report Generated : Report

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Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ

REVIEW BY [redacted]

APPROVED

NEXT CAL. DATE 9 May 26.

System ID:	2025_ALS_GC#11_CN2303A021_OQHW
Organization Name:	ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location:	104 Soi 40 Phatthanakan Rd,Khwang Suan Luang, Khet Suan Luang, Bangkok 10250
Date:	May 9, 2025 11:32:14 AM
EQP Name:	AgilentRecommended
EQP Revision:	GC.02.53
Overall Qualification Status:	Pass

CDS Logon Verification - GC

Logon: [redacted]

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name:	8890
Setpoint Status:	**Pass**

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 8890

Front SSL

Setpoint Status:	**Pass**				
Pressure:	25.0	psi			
Pressure Change:		-0.1	psi	/5 minutes	
Agilent Recommended:	>=	-2.0	and	<=	0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 8890
Front SSL

Setpoint Status: **Pass**

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	24.9	psi

Accuracy: 0.1 psi

Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 8890
Back SSL

Setpoint Status: **Pass**

Pressure: 25.0 psi

Pressure Change: -0.1 psi /5 minutes

Agilent Recommended: >= -2.0 and <= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 8890
Back SSL

Setpoint Status: Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	24.8	psi

Accuracy: 0.2 psi

Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 8890 Front FID

Setpoint Status: Pass

Flow Type: Fuel

Setpoint: 30.0 mL/min Measured Flow: 30.3 mL/min

Accuracy: 0.3 mL/min

Agilent Recommended: <= 10.0 % setpoint (3.0 ml/min)

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

Setpoint Status: Pass

Flow Type: Oxidizer

Setpoint: 400.0 mL/min Measured Flow: 398 mL/min

Accuracy: 2.0 mL/min

Agilent Recommended: <= 10.0 % setpoint (40.0 ml/min)

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

Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 mL/min Measured Flow: 25.1 mL/min

Accuracy: 0.1 mL/min

Agilent Recommended: <= 10.0 % setpoint (2.5 ml/min)

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

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 8890

Back FID

Setpoint Status: **Pass**

Flow Type: Fuel

Setpoint: 30.0 mL/min Measured Flow: 30.1 mL/min

Accuracy: 0.1 mL/min

Agilent Recommended: <= 10.0 % setpoint (3.0 ml/min)

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

Setpoint Status: **Pass**

Flow Type: Oxidizer

Setpoint: 400.0 mL/min Measured Flow: 391 mL/min

Accuracy: 9.0 mL/min

Agilent Recommended: <= 10.0 % setpoint (40.0 ml/min)

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

Setpoint Status: **Pass**

Flow Type: Makeup

Setpoint: 25.0 mL/min Measured Flow: 24.8 mL/min

Accuracy: 0.2 mL/min

Agilent Recommended: <= 10.0 % setpoint (2.5 ml/min)

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

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 8890

Setpoint Status:	**Pass**						
Zone:	Oven						
	Setpoint/Actual						
Temperature:	230.0	230.4	°C				
Accuracy:		0.4	°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	100.2	°C				
Accuracy:		0.2	°C				
Agilent Recommended:	>=	-1.0	% setpoint in K	(	-3.7	°C	)
	<=	1.0	% setpoint in K	(	3.7	°C	)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name:	8890						
Setpoint Status:	**Pass**						
	Setpoint/Average						
Temperature:	100.0	100.2	°C				
Stability:		0.0	°C				
Agilent Recommended:	<=	0.5					

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1	Front	SSL	/ Front	FID	
	Injection Tower				
Name:	7693A				

Setpoint Status: **Completed**

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: 8890

Setpoint Status: **Pass**

Base Signal: 5.89 pA

		ASTM Noise pA		Drift pA/h
		0.05		1.11
Agilent Recommended:	<=	0.10	<=	2.50
Status:	Pass		Pass	

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Name: 7693A

Setpoint Status: **Pass**

Injection Volume on Column: 1.0 uL

Area RSD:		0.06 %	Retention Time RSD:		0.19 %
Agilent Recommended:	<=	3.00		<=	1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination1	Front Injection Tower	SSL	/ Front	FID
Name:	8890			

Setpoint Status: Pass

Signal to Noise:		994826
Agilent Recommended:	>=	300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2	Back Injection Tower	SSL	/ Back	FID
Name:	7693A			

Setpoint Status: **Completed**

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2	Back	SSL	/ Back	FID
Name:	8890			

Setpoint Status: **Pass**

Base Signal: 17.79 pA

		ASTM Noise pA		Drift pA/h
		0.04		0.07
Agilent Recommended:	<=	0.10	<=	2.50
Status:		Pass		Pass

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2	Back	SSL	/ Back	FID				
Name:	7693A							
Setpoint Status:	**Pass**							
Injection Volume on Column:	1.0	uL						
Area RSD:		0.52	%	Retention Time RSD:		0.23	%	
Agilent Recommended:	<=	3.00			<=	1.00		

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2	Back	SSL	/ Back	FID	
	Injection Tower				
Name:	8890				
Setpoint Status:	**Pass**				
Signal to Noise:		837739			
Agilent Recommended:	>=	300000			

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	2025_ALS_GC#11_CN2303A021_OQHW
Manufacturer	Agilent Technologies
Name	8890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No

Tested Combination2

Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Back
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN23125107
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN23125121
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

Sampler 3

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN2314054
Firmware Revision	A.12.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A021
Firmware Revision	3.0.3.21
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Inlet 2

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	8890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	8890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

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:	[redacted]
Logged On User Name:	
Signature Creation Date:	May 9, 2025
Reason for Signature:	Executed protocol and published this original version of document

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 1:49:44 PM	Audit	SessionCreated	Session	Host Name: LAPTOP-CQ3SKOMV, Drive Serial Number: 64A9D8A8
May 8, 2025 1:49:44 PM	start	Configuration	Session	None
May 8, 2025 1:49:44 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
May 8, 2025 1:56:00 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.53/Gc.02.53.eqp], EQP File Name: [Gc.02.53.eqp], EQP Name: [AgilentRecommended],Protocol Revision :[Gc.02.53]
May 8, 2025 1:56:02 PM	End	Configuration	Session	None
May 8, 2025 1:56:09 PM	start	Qualification	Session	PM
May 8, 2025 1:56:10 PM	start	Qualification	Session	OQ
May 8, 2025 1:56:10 PM	start	Execution	System Inspection - 8890: - Mainframe	None
May 8, 2025 1:56:45 PM	End	Execution	System Inspection - 8890: - Mainframe	Run Count : 1
May 8, 2025 1:56:47 PM	start	Execution	Mainframe Maintenance - 8890: - Mainframe: 8890	None
May 8, 2025 1:56:56 PM	End	Execution	Mainframe Maintenance - 8890: - Mainframe: 8890	Run Count : 1
May 8, 2025 1:56:58 PM	start	Execution	Inlet Maintenance - Front SSL: - Inlet: 8890	None
May 8, 2025 1:57:57 PM	End	Execution	Inlet Maintenance - Front SSL: - Inlet: 8890	Run Count : 1

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User Name: saengulhai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKDMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 1:58:00 PM	start	Execution	Inlet Maintenance - Back SSL: - Inlet: 8890	None
May 8, 2025 1:58:52 PM	End	Execution	Inlet Maintenance - Back SSL: - Inlet: 8890	Run Count : 1
May 8, 2025 1:58:54 PM	start	Execution	Detector Maintenance - Front FID: - GC Detector: 8890	None
May 8, 2025 1:59:48 PM	End	Execution	Detector Maintenance - Front FID: - GC Detector: 8890	Run Count : 1
May 8, 2025 1:59:50 PM	start	Execution	Detector Maintenance - Back FID: - GC Detector: 8890	None
May 8, 2025 2:00:25 PM	End	Execution	Detector Maintenance - Back FID: - GC Detector: 8890	Run Count : 1
May 8, 2025 2:00:27 PM	start	Execution	Sampler Maintenance - Front Injection Tower: - Sampler: 7693A	None
May 8, 2025 2:00:54 PM	End	Execution	Sampler Maintenance - Front Injection Tower: - Sampler: 7693A	Run Count : 1
May 8, 2025 2:00:55 PM	start	Execution	Sampler Maintenance - Back Injection Tower: - Sampler: 7693A	None
May 8, 2025 2:01:05 PM	End	Execution	Sampler Maintenance - Back Injection Tower: - Sampler: 7693A	Run Count : 1
May 8, 2025 2:01:09 PM	start	Execution	Service Review - 8890: - Qualitative Test - No setpoints associated	None
May 8, 2025 2:01:41 PM	End	Execution	Service Review - 8890: - Qualitative Test - No setpoints associated	Run Count : 1
May 8, 2025 2:01:43 PM	End	Qualification	Session	PM

User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ35KOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:01:43 PM	start	Qualification	Session	OQ
May 8, 2025 2:01:43 PM	start	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	None
May 8, 2025 2:06:13 PM	End	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	Run Count : 1
May 8, 2025 2:06:16 PM	start	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	None
May 8, 2025 2:06:30 PM	End	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	Run Count : 1
May 8, 2025 2:06:43 PM	start	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
May 8, 2025 2:11:09 PM	End	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
May 8, 2025 2:11:11 PM	start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 8, 2025 2:12:26 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 8, 2025 2:12:27 PM	start	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None

User Name: saengutkai,tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:17:04 PM	End	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
May 8, 2025 2:17:06 PM	start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 8, 2025 2:18:01 PM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 8, 2025 2:18:04 PM	start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
May 8, 2025 2:18:27 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
May 8, 2025 2:18:30 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
May 8, 2025 2:18:32 PM	start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
May 8, 2025 2:19:04 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
May 8, 2025 2:19:06 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
May 8, 2025 2:19:08 PM	start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None

User Name: saengulhai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:20:02 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
May 8, 2025 2:20:06 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
May 8, 2025 2:20:08 PM	start	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
May 8, 2025 2:21:13 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
May 8, 2025 2:21:14 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
May 8, 2025 2:21:17 PM	start	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
May 8, 2025 2:21:31 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
May 8, 2025 2:21:35 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
May 8, 2025 2:21:37 PM	start	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
May 8, 2025 2:22:03 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
May 8, 2025 2:22:05 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:22:08 PM	start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 2:23:02 PM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 8, 2025 2:23:07 PM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 2:23:09 PM	start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 2:25:03 PM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 8, 2025 2:25:05 PM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 2:25:07 PM	start	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
May 8, 2025 2:31:03 PM	Audit	Data	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
May 8, 2025 2:31:04 PM	End	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1

User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:31:12 PM	start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
May 8, 2025 2:31:35 PM	Audit	AceClosed	Session	None
May 9, 2025 8:32:28 AM	Audit	AceRestarted	Session	Host Name: LAPTOP-CQ3SKOMV, Drive Serial Number: 64A9D8A8
May 9, 2025 8:32:30 AM	Audit	SessionReloaded	Session	None
May 9, 2025 8:32:46 AM	start	Qualification	Session	PM
May 9, 2025 8:32:46 AM	start	Qualification	Session	OQ
May 9, 2025 8:32:46 AM	start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
May 9, 2025 8:34:41 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : F:\OQ2025\Data\OQGC-11.rslt\OQ_Front_SC-F.dx
May 9, 2025 8:34:55 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 100;Integration: Off at 0;Integration: On at 0.015;Integration: Off at 0.5]
May 9, 2025 8:35:11 AM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 8:35:14 AM	start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
May 9, 2025 8:56:15 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : F:\OQ2025\Data\OQGC-11_2 .rslt\OQ_Front_ND-F.dx
May 9, 2025 8:56:27 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
May 9, 2025 8:56:31 AM	start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
May 9, 2025 9:34:24 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\OQGC-11_ Front_IP.rslt\OQ_Front_IP-r0 04.dx
May 9, 2025 9:34:24 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\OQGC-11_ Front_IP.rslt\OQ_Front_IP-r0 05.dx
May 9, 2025 9:34:24 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\OQGC-11_ Front_IP.rslt\OQ_Front_IP-r0 06.dx
May 9, 2025 9:34:24 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\OQGC-11_ Front_IP.rslt\OQ_Front_IP-r0 07.dx

User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 9:34:24 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\OQGC-11_Front_IP.rslt\OQ_Front_IP-r008.dx
May 9, 2025 9:34:24 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\OQGC-11_Front_IP.rslt\OQ_Front_IP-r009.dx
May 9, 2025 9:34:34 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 100;Integration: Off at 0;Integration: On at 0.015;Integration: Off at 0.5]
May 9, 2025 9:34:43 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
May 9, 2025 9:34:49 AM	start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	None
May 9, 2025 9:35:19 AM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : F:\OQ2025\Data\OQGC-11_Front_SN.rslt\OQ_Front_SN.dx

User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 9:35:27 AM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 100;Integration: Off at 0;Integration: On at 0.015,Integration: Off at 0.5]
May 9, 2025 9:35:34 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Run Count : 1
May 9, 2025 9:35:38 AM	start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	None
May 9, 2025 9:46:40 AM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_SC-1.rslt\OQ_Back_SC.dx
May 9, 2025 9:46:57 AM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Run Count : 1
May 9, 2025 9:47:00 AM	start	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
May 9, 2025 10:51:05 AM	Audit	Data	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_ND-2.rslt\OQ_Back_ND-B.dx

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System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 10:51:12 AM	End	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
May 9, 2025 10:51:16 AM	start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
May 9, 2025 11:09:34 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_IP-1.rslt\OQ_Back_IP-r001.dx
May 9, 2025 11:09:34 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_IP-1.rslt\OQ_Back_IP-r002.dx
May 9, 2025 11:09:34 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_IP-1.rslt\OQ_Back_IP-r003.dx
May 9, 2025 11:09:34 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_IP-1.rslt\OQ_Back_IP-r004.dx
May 9, 2025 11:09:34 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_IP-1.rslt\OQ_Back_IP-r005.dx
May 9, 2025 11:09:34 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_IP-1.rslt\OQ_Back_IP-r006.dx

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System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 11:09:46 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Rel, Time): <= 1.00%	Run Count : 1
May 9, 2025 11:09:49 AM	start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	None
May 9, 2025 11:16:51 AM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	Data files Path : F:\OQ2025\Data\Back\OQGC-11_Back_SN.rslt\OQ_Back_SC.dx
May 9, 2025 11:17:07 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	Run Count : 1
May 9, 2025 11:17:11 AM	End	Qualification	Session	OQ
May 9, 2025 11:17:11 AM	start	Reporting	Session	None
May 9, 2025 11:24:47 AM	Audit	Reporting	Session	Report Generated : Report
May 9, 2025 11:25:23 AM	Audit	Reporting	Session	Report Signed : Report PDF Name: 2025_ALS_GC11_CN2303A021_OQHW_20250509_PM Report_1.pdf User Name: saenguthai.tarak@non.agilent.com Full Name of Signer: Saenguthai Tarak Reason for signature: Executed protocol and published this original version of document
May 9, 2025 11:30:23 AM	Audit	Reporting	Session	Report Generated : Certificate

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Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: 2025_ALS_GC#11_CN2303A021_OQHW
Print Date: May 9, 2025 11:32:16 AM

2025_ALS_GC11_CN2303A021_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 11:31:17 AM	Audit	Reporting	Session	Report Generated : Report

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