ภาคผนวก ง

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Total Suspended Particulate	High Volume	RYG_FS0662	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0177	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0394	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	3-Feb-26	3-Feb-27	12
Ambient	Nitrogen Dioxide	NO_2 Analyzer	RYG_FS0463	5-Jan-26	5-Jul-26	6
Ambient	Nitrogen Dioxide	NO_2 Analyzer	RYG_FS0264	5-Jan-26	5-Jul-26	6
Ambient	Nitrogen Dioxide	NO_2 Analyzer	RYG_FS0272	5-Jan-26	5-Jul-26	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0724	16-Feb-26	15-Aug-27	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0328	8-May-25	7-Nov-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0650	7-Feb-25	7-Aug-26	18
Stack	Carbon Monoxide	Console Control Unit	RYG_FS0315	6-Jan-26	6-Jul-26	6
Stack	Carbon Monoxide	Pitot Tube	RYG_FS0320	6-Jan-26	6-Jul-26	6
Stack	Carbon Monoxide	Fuel Gas Analyzer	RYG_FS0564	8-May-26	7-May-27	12
Stack	Carbon Monoxide	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Carbon Monoxide	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Stack	Carbon Monoxide	Air Sampling Pump	RYG_FS0690	3-Apr-26	3-Jul-26	3
Stack	Carbon Monoxide	CO Analyzer	RYG_EN0034	3-Jul-25	3-Jul-26	12
Stack	Oxides of Nitrogen	Console Control Unit	RYG_FS0315	6-Jan-26	6-Jul-26	6
Stack	Oxides of Nitrogen	Pitot Tube	RYG_FS0320	6-Jan-26	6-Jul-26	6
Stack	Oxides of Nitrogen	Fuel Gas Analyzer	RYG_FS0564	8-May-26	7-May-27	12
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_FS0479	8-Jan-26	7-Jul-27	18
Stack	Oxides of Nitrogen	SPECTROPHOTOMETER	RYG_EN0037	18-Mar-25	18-Sep-26	18
Stack	Total Suspended Particulate	Console Control Unit	RYG_FS0315	6-Jan-26	6-Jul-26	6
Stack	Total Suspended Particulate	Pitot Tube	RYG_FS0320	6-Jan-26	6-Jul-26	6
Stack	Total Suspended Particulate	Fuel Gas Analyzer	RYG_FS0564	8-May-26	7-May-27	12
Stack	Total Suspended Particulate	Digital Balance	RYG_EN0003	3-Feb-26	3-Feb-27	12
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Total Dust	Digital Balance	RYG_EN0004	20-Feb-25	20-Feb-26	12
Workplace	Total Dust	Digital Balance	RYG_EN0004	3-Feb-26	3-Feb-27	12
Workplace	Styrene	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Styrene	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Styrene	GC-MSD	BKK_EN0049	22-Oct-25	21-Oct-26	12
Workplace	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Total Hydrocarbon	Total Hydrocarbon Analyzer	RYG_FS0762	15-Jan-26	14-Jan-27	12
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0216	19-Aug-25	18-Aug-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0303	18-Aug-25	17-Aug-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0031	18-Aug-25	17-Aug-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0304	18-Aug-25	17-Aug-26	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_FS0215	8-Oct-25	7-Oct-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0016	16-Sep-25	15-Sep-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0022	19-Mar-25	19-Mar-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0023	19-Mar-25	19-Mar-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0029	18-Aug-25	18-Aug-26	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_FS0213	9-Jan-26	8-Jan-27	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0016	16-Sep-25	15-Sep-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0017	21-Jan-26	20-Jan-27	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0018	21-Jan-26	20-Jan-27	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0019	21-Jan-26	20-Jan-27	12

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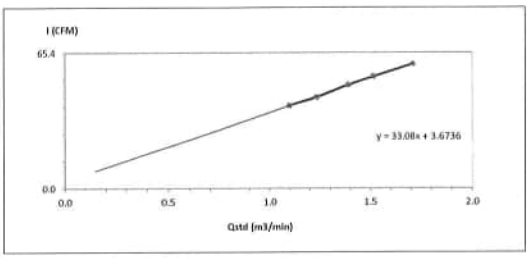
รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Rayong Lab	pH at 25 °C	pH Meter	RYG_EN0183	18-Jul-25	18-Jan-27	18
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	20-Jan-25	20-Jul-26	18
Rayong Lab	BOD	Incubator	RYG_EN0154	18-Mar-26	18-Sep-27	18
Rayong Lab	BOD	Burette	RYG_EN0216	18-Sep-25	18-Sep-26	12
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0163	3-Feb-26	3-Feb-27	12
Rayong Lab	Total Suspended Solids	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0163	3-Feb-26	3-Feb-27	12
Rayong Lab	Total Dissolved Solids 180°C	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Total Kjeldahl Nitrogen	Block Digestion Unit	RYG_EN0188	10-Sep-25	10-Mar-27	18
Rayong Lab	Total Kjeldahl Nitrogen	pH Meter	RYG_EN0183	18-Jul-25	18-Jan-27	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0003	3-Feb-26	3-Feb-27	12
Rayong Lab	Oil & Grease	Liquid Bath (Water)	RYG_EN0220	27-Nov-25	27-Nov-26	12
Rayong Lab	Temperature	pH meter	RYG_FS0607	26-Nov-25	26-Nov-26	12
Rayong Lab	Color (at Original pH)	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Color (at pH 7.0)	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Cyanide	SPECTROPHOTOMETER	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Formaldehyde	SPECTROPHOTOMETER	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Phenol	SPECTROPHOTOMETER	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Sulfide	Chamber (Cold Room)	RYG_EN0184	27-Nov-25	27-May-27	18
Rayong Lab	Residual Free Chlorine	Chamber (Cold Room)	RYG_EN0184	27-Nov-25	27-May-27	18
Rayong Lab	Conductivity	Conductivity meter	RYG_EN0200	1-Dec-25	1-Dec-26	12
Rayong Lab	Total Petroleum Hydrocarbon	Electronic Balance	RYG_EN0003	3-Feb-26	3-Feb-27	12
Rayong Lab	Total Petroleum Hydrocarbon	Liquid Bath (Water)	RYG_EN0220	27-Nov-25	27-Nov-26	12
Rayong Lab	Arsenic	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Arsenic	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Barium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Barium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Cadmium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Cadmium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Trivalent Chromium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Trivalent Chromium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Copper	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Copper	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Lead	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Lead	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Manganese	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Manganese	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Nickel	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Nickel	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Selenium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Selenium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Zinc	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Zinc	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Hexavalent Chromium	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Mercury	Mercury Analyzer	RYG_EN0223	21-Jul-25	21-Jul-26	12
Water Lab	Total Organic carbon	TOC Analyzer	BKK_EN0066	27-Jun-25	27-Jun-26	12
Water Lab	Organochlorine Pesticide	GC MSMS	BKK_EN0284	21-Nov-25	21-May-27	18

High Volume Air Sampler Calibration Worksheet

Project Site :	Siam Polystyrene Co., Ltd.	**Barometric Pressure (mm Hg) :**	751.2
Calibrate Location :	ริมขั้วด้านทิศตะวันตกของ บริษัท ปูน เอ็นเอช์ปี จำกัด (มหาชน)	**Temperature (°C) :**	30.1
Calibrate Date :	25-May-26	**High Volume ID :**	RYG_FS0662
CalibrationSheet No.:	C-250526-RYG_FS0662	**High Volume Model :**	TE-5009X
Calibrator ID:	RYG_FS0206	**High Volume S/N :**	6259
Calibrator Model :	TE-5028A	**Calibrator Slope :**	1.4719
Calibrator S/N :	1543	**Calibrator Intercept :**	-0.01614

Test No.	Delta H_2O (inch)	Q_{std} (m^3/min)	I : Chart (CFM)	Linear Regression	
1	2.6	1.0961	40	Slope :	33.0801
2	3.3	1.2328	44	Intercept :	3.6736
3	4.2	1.3887	50	Correlation Coefficient :	0.9990
4	5.0	1.5137	54		
5	6.4	1.7105	60		



Calibrated by : Adisak T.
(Mr. Adisak Tarisoon)
RYG Field Services Scientist (3)

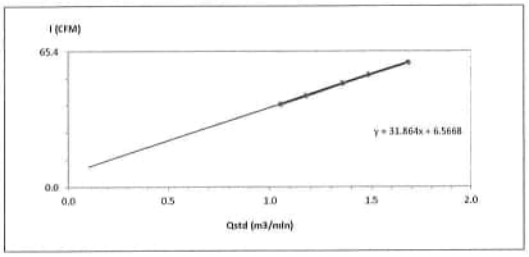
Approved by : Supot S.
(Mr. Supot Salamteh)
Field Services Section Head

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

High Volume Air Sampler Calibration Worksheet

Project Site :	Siam Styrene Monomer Co., Ltd.	**Barometric Pressure (mm Hg) :**	751.2
Calibrate Location :	บ้านมาบตาพุด	**Temperature (°C) :**	30.1
Calibrate Date :	25-May-26	**High Volume ID :**	RYG_FS0177
CalibrationSheet No.:	C-250526-RYG_FS0177	**High Volume Model :**	TE-5170D
Calibrator ID:	RYG_FS0206	**High Volume S/N :**	4803
Calibrator Model :	TE-5028A	**Calibrator Slope :**	1.4719
Calibrator S/N :	1543	**Calibrator Intercept :**	-0.01614

Test No.	Delta H_2O (inch)	Q_{std} (m^3/min)	I : Chart (CFM)	Linear Regression	
1	2.4	1.0537	40	Slope :	31.8637
2	3.0	1.1762	44	Intercept :	6.5668
3	4.0	1.3556	50	Correlation Coefficient :	0.9997
4	4.8	1.4835	54		
5	6.2	1.6838	60		



Calibrated by : Adisak T.
(Mr. Adisak Tarisoon)
RYG Field Services Scientist (3)

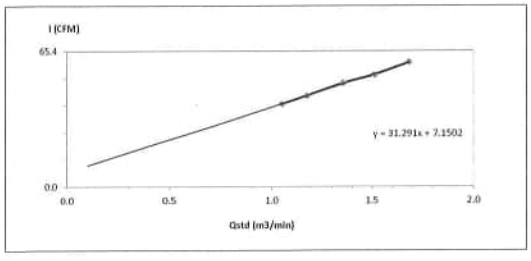
Approved by : Supot S.
(Mr. Supot Salamteh)
Field Services Section Head

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

High Volume Air Sampler Calibration Worksheet

Project Site :	Siam Styrene Monomer Co., Ltd.	**Barometric Pressure (mm Hg) :**	751.2
Calibrate Location :	บ้านอำวประชุม(โรงพยาบาลส่งเสริมสุขภาพตำบลตากวน)	**Temperature (°C) :**	30.1
Calibrate Date :	25-May-26	**High Volume ID :**	RYG_FS0394
CalibrationSheet No.:	C-250526-RYG_FS0394	**High Volume Model :**	TE-5170D
Calibrator ID:	RYG_FS0206	**High Volume S/N :**	5690
Calibrator Model :	TE-5028A	**Calibrator Slope :**	1.4719
Calibrator S/N :	1543	**Calibrator Intercept :**	-0.01614

Test No.	Delta H_2O (inch)	Q_{std} (m^3/min)	I : Chart (CFM)	Linear Regression	
1	2.4	1.0537	40	Slope :	31.2915
2	3.0	1.1762	44	Intercept :	7.1502
3	4.0	1.3556	50	Correlation Coefficient :	0.9990
4	5.0	1.5137	54		
5	6.2	1.6838	60		



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RYG Field Services Scientist (3)

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

FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23

SARTORIUS

Accredited by
NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 26BCI0067

Object	Electronic non-automatic weighing instrument
Manufacturer	Sartorius
Type	LA130S-F
Serial | QM Ident. no.	25409864 | RYG_EN0001
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
	616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand.
Order no.	278579
Number of pages	4
Date of calibration	03 Feb 2026

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.

Thanitak.
03/02/27

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	Approval of the Calibration Certificate	Person in charge
03 Feb 2026	Mr. Chonchai Inthana	Chonchai Inthana

Calibration object

Single range instrument

Model	LA130S-F
Serial Number	25409664
QM Ident. no | Inventory no.	RYG_EN0001 | —

Maximum capacity (Max. load)	150.0000 g
Measured up to	150.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department | Cost center	Laboratory Department. | —
Building | Floor	— | 1st Floor.
Room	Balance Room.
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 H/T250743 (Traceable to SI unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M2508149S ,E2(Traceable to SI unit through TCS)	19 Aug 2027

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	03 Feb 2026
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	24.5 °C | 0.5 K
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 52.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g | 100 g		
	10 g	100 g
1	10.0000 g	100.0000 g
2	10.0000 g	99.9998 g
3	9.9999 g	100.0000 g
4	10.0001 g	100.0000 g
5	10.0000 g	99.9999 g
6	9.9999 g	100.0000 g
7	9.9999 g	99.9999 g
8	9.9999 g	100.0000 g
9	9.9999 g	100.0000 g
10	9.9999 g	99.9999 g
	s = 0.00007 g	s = 0.00007 g

Eccentricity

Test load (nominal):	50 g
Center	50.0000 g
Front left	50.0001 g
Back left	50.0001 g
Back right	50.0000 g
Front right	50.0001 g

Maximum deviation from centric loading indication
$|\Delta_{Ecc}|_{max}$ = 0.0001 g

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty $U(E)$	Uncertainty relative $U_{rel}(E)$
0.0100 g	0.0100 g	0.0000 g	2.00	0.00016 g	1.6 %
0.0500 g	0.0500 g	0.0000 g	2.00	0.00016 g	0.33 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00016 g	0.16 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00016 g	0.033 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00016 g	0.016 %
2.0000 g	2.0000 g	0.0000 g	2.00	0.00017 g	0.0083 %
5.0000 g	5.0001 g	0.0001 g	2.00	0.00017 g	0.0033 %
10.0000 g	10.0001 g	0.0001 g	2.00	0.00017 g	0.0017 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00017 g	0.00086 %
100.0000 g	100.0001 g	0.0001 g	2.00	0.00023 g	0.00023 %
150.0000 g	150.0001 g	0.0001 g	2.00	0.00030 g	0.00020 %

Maximum error of indication $|E|_{max}$ = 0.0001 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

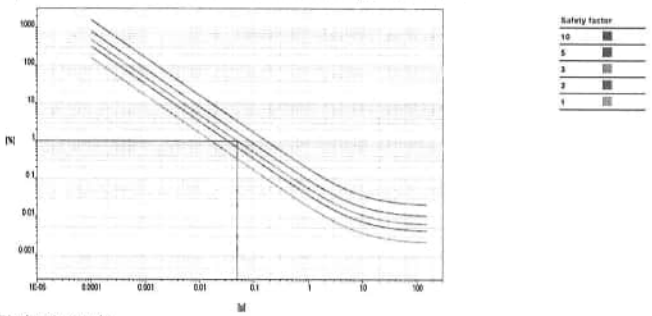
Uncertainty of measurement in use

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	1 · 10⁻⁴/K
Uncertainty of the weighing result $U_{gl}(W)$	$U_{gl}(W) = 0.00016\ g + 1.95 \cdot 10^{-4} \cdot R$

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.

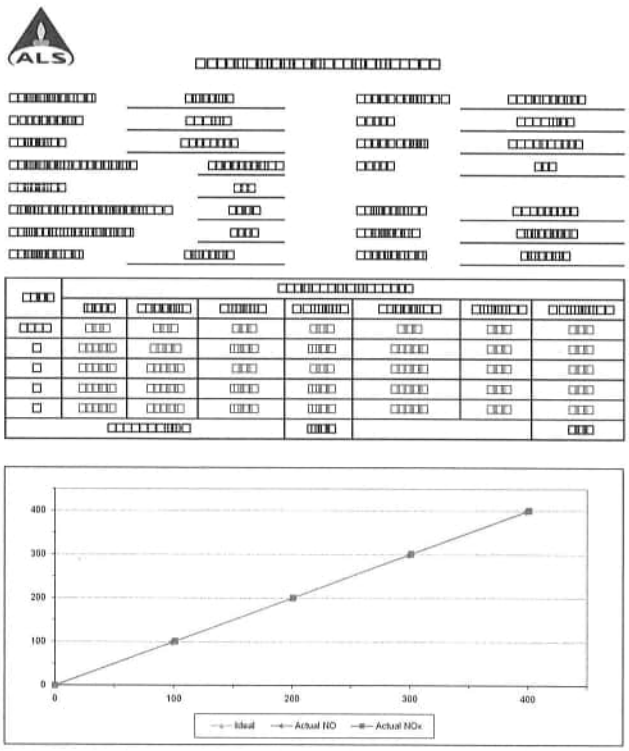
Indication in % from max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	1.5000 g	0.00019 g	0.013 %
25 %	37.5000 g	0.00089 g	0.0024 %
50 %	75.0000 g	0.0016 g	0.0022 %
75 %	112.5000 g	0.0024 g	0.0021 %
100 %	150.0000 g	0.0031 g	0.0021 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0493 g

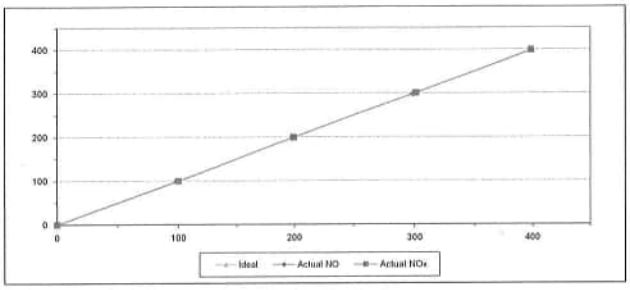


ALS Laboratory Group

MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	8G314J3K	Equipment ID	RYG_FS0264
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	100.10	0.10	0.10
2	200.00	198.70	-1.30	-0.65	199.40	-0.60	-0.30
3	300.00	298.70	-1.30	-0.43	301.40	1.40	0.47
4	400.00	398.60	-1.40	-0.35	398.70	-1.30	-0.33
AVERAGE (%)				-0.46			0.01



Calibrated By

(Mr.Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

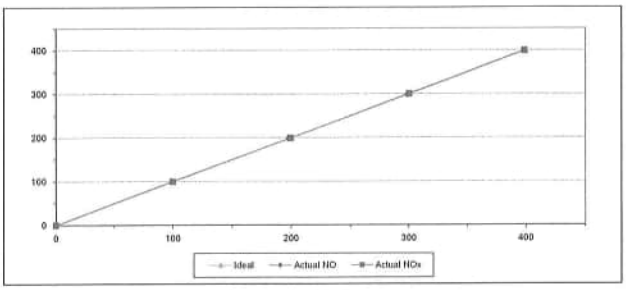
ALS Laboratory Group

FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12

MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	7AV89544	Equipment ID	RYG_FS0272
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	100.10	0.10	0.10
2	200.00	198.70	-1.30	-0.65	199.50	-0.50	-0.25
3	300.00	298.60	-1.40	-0.47	300.30	0.30	0.10
4	400.00	398.90	-1.10	-0.28	398.70	-1.30	-0.33
AVERAGE (%)				-0.45			-0.06



Calibrated By

(Mr.Jirawut Sakam)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

ALS Laboratory Group

FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12

JNAC
JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.
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Air speed measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWS 013 69

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM	: Cup anemometer
MANUFACTURER	: Novalynx
MODEL/TYPE	: Sensor: WS-02FA Data logger: 110-WS-250L-D
SERIAL NUMBER	: Sensor: WS0-A5986 Data logger: A5986
ID NUMBER	: RYG_FS0724
CONDITION AS RECEIVED	: Used Item
CUSTOMER	: ALS laboratory group (Thailand) Co., Ltd. 184 Phutthamkan 40, Phutthamkan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 06 Feb 2026
MEASUREMENT DATE	: 16 Feb 2026
ISSUE DATE	: 16 Feb 2026

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1030± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

Wind tunnel cross section area[1]	900	cm^2
Cup anemometer frontal area[2]	100	cm^2
Diameter of mounting pipe[3]	-	mm
Blockage ratio of test object[4]	0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.4) °C, (55.8) %RH and (1012.4) hPa

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
☑ Mr. Sorawit Prachakul
☐ Miss Jittrapron Lertsomphol

Approved signatory .....
Mr. Parinya Boonthareen
Calibration Department Manager

Calibration procedure:
The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an open test section of Eiffel type wind tunnel with 900 cm^2 cross test section area. The IW-CL-002 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0019-25 and MW-0059-25

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

REVIEW BY
APPROVED BY
NEXT CAL DATE 15/02/2027

Remark:
[1] Nozzle cross section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio of [1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Certificate Number
CWS-013-69

Page 2 of 2 Pages

MEASUREMENT RESULTS [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V_{ref} [2] (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V_{UUC} [3] (m/s)	Error (m/s)	U (k=2) (m/s)
0.981	23.50	23.35	0.8	-0.2	0.31
2.126	23.42	23.35	1.9	-0.2	0.31
3.009	23.36	23.35	2.8	-0.2	0.31
4.224	23.40	23.35	3.9	-0.3	0.31
5.01	23.14	23.35	5.0	0.0	0.31
6.00	23.54	23.35	5.9	-0.1	0.31
7.01	23.18	23.35	6.9	0.2	0.31
8.01	23.42	23.35	7.9	-0.1	0.31
8.99	23.30	23.35	9.0	0.0	0.31
10.01	23.42	23.35	10.1	0.1	0.31
11.00	22.08	23.35	11.1	0.1	0.31
11.99	23.10	23.35	12.1	0.1	0.31
12.99	23.10	23.35	13.2	0.2	0.31
13.99	23.04	23.35	14.2	0.2	0.34
14.98	23.18	23.35	15.3	0.3	0.37
15.97	23.06	23.35	16.3	0.3	0.34

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Velocity of standard
[3] Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.

End of Certificate of Calibration

JIRANATEE ASSOCIATES CO.,LTD.
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Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI TIS 17025
CALIBRATION 0367

Wind direction measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWD-013-69

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM	: Wind Direction Sensor	
MANUFACTURER	: Novalynx	
MODEL/TYPE	: Sensor: WS-02FA Data logger: 110-WS-2SDL-D	
SERIAL NUMBER	: Sensor: WSD-A5986 Data logger: A5986	
ID NUMBER	: RYG_FS0724	
CONDITION AS-RECEIVED	: Used item	
CUSTOMER	: ALS laboratory group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.	
RECEIVED DATE	: 06 Feb 2026	
MEASUREMENT DATE	: 16 Feb 2026	
ISSUE DATE	: 16 Feb 2026	
ENVIRONMENTAL CONDITIONS:		
Ambient condition in the laboratory are as follow:		
Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa
PLACE OF CALIBRATION	: Eiffel type wind tunnel of Jiranatee Associates Co., Ltd.	
CALIBRATION CONDITION	: Wind tunnel cross-section area[1]	900 cm²
	Wind direction frontal area[2]	129 cm²
	Diameter of mounting pipe[3]	- mm
	Blockage ratio of test object[4]	0.143 (-)
Preconditioning	: 24 hours at ambient conditions.	
Measurement Condition	: The average values during measurement are (23.3)°C, (62.2) %RH and (1009.9) hPa	

Calibration procedure:
The wind direction sensor was calibrated against Standard Rotary Encoder model: AK409YS-ND6M-F3-S-D3 in an close test section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: BA 0027-24.

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data – Guide to the expression of uncertainty in measurement'

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Leetsomphol

Approved signatory
Mr. Parinya Boonchareon
Calibration Department Manager

Remark:
[1] Nozzle cross-section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [1] to [2]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Certificate Number
CWD-013-69

MEASUREMENT RESULTS [1]

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed	D'_{UUC}	D'_{STD}	Error	U (k=2)
m/s	Degree (°)	Degree (°)	Degree (°)	Degree (°)
5.00	0.000	0	0	0.60
	45.000	42	-3	0.60
	90.000	86	-4	0.60
	135.000	131	-4	0.60
	180.000	177	-3	0.82
	225.000	224	-1	0.82
	270.000	272	2	0.60
	315.000	320	5	0.60

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Direction of standard
[3] Direction of Unit Under Calibration

End of Certificate of Calibration

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Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI TIS 17025
CALIBRATION 0367

Pressure measurement laboratory
Calibration services department.

NSC - TISI - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CPR-008-69

MEASUREMENT ITEM	: Digital barometer	
MANUFACTURER	: Novalynx	
MODEL/TYPE	: Sensor: 110-WS-2SBP Data logger: 110-WS-2SDL-D	
SERIAL NUMBER	: Sensor: BP-A5986 Data logger: A5986	
ID NUMBER	: RYG_FS0724	
CONDITION AS-RECEIVED	: Used item	
CUSTOMER	: ALS laboratory group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.	
RECEIVED DATE	: 06 Feb 2026	
MEASUREMENT DATE	: 16 Feb 2026	
ISSUE DATE	: 16 Feb 2026	

Calibration procedure:
The Digital barometer was calibrated against Digital pressure calibrator. The WI-CL-003 was used as a calibration guideline.

Traceability:
The measurement results are traceable to the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MP-0017-25

Reference Used During Calibration:
1. Absolute Pressure Transducer
Model: CPG2500, Serial No.: 41001260

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data – Guide to the expression of uncertainty in measurement'

CONDITION OF THIS RESULT OF CALIBRATION:
1. Calibration effort for calibration sequence C
2. The UUC* was installed in vertical orientation above reference standard instrument and center of UUC* was used as the reference level.
3. Calibration conditions:
4. Condition : ☑ Normal ☐ Abnormal
   Pressure transmitting medium : Air
   ρ_n (20°C, 1 bar) : 1.19 kg/m³
   H_{env} : (65.1±5.8) %
   t_{amb} : (23.2±0.2) °C
   P_{amb} : (1004.7±1.1) mbar
5. The certificate is valid only to the item calibrated on date and place of calibration

Calibrated by:
☑ Mr. Sorawit Thachalad
☐ Miss Jittraporn Leetsomphol

Approved signatory
Mr. Parinya Boonchareon
Calibration Department Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

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Jiranatee Associates Co.,Ltd.
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Pressure measurement laboratory
Calibration services department.

NSC - TISI - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CPR-008-69

MEASUREMENT RESULTS : ☐ Without adjustment ☑ With adjustment
CALIBRATION IN THE RANGE OF : 950 mbar to 1050 mbar

The results of calibration and associated measurement uncertainties are reported in the table below.

STD	UUC*	Error	Uncertainty (k=2)
(mbar)	(mbar)	(mbar)	(mbar)
949.98	952.1	2.1	0.38
969.96	971.3	1.3	0.37
990.00	990.7	0.7	0.37
1009.93	1010.0	0.0	0.39
1029.97	1029.3	0.7	0.37
1049.95	1048.6	-1.3	0.40

Note: UUC* Unit Under Calibration
: To convert the result in report unit to Pa should be multiply by 100

End of certificate

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Air speed measurement laboratory
Calibration services department

NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWS-014-68

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM	: Cup anemometer	
MANUFACTURER	: Novalynx	
MODEL/TYPE	: Sensor: WS-02F Data logger: 200-WS-25LB	
SERIAL NUMBER	: Sensor: WSD-A5191 Data logger: A5191	
ID NUMBER	: RYG_FS0328	
CONDITION AS-RECEIVED	: Used item	
CUSTOMER	: ALS laboratory group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.	
RECEIVED DATE	: 18 Apr 2025	
MEASUREMENT DATE	: 08 May 2025	
ISSUE DATE	: 09 May 2025	

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS			
	: Wind tunnel cross-section area[1]	900	cm^2
	Cup anemometer frontal area[2]	160	cm^2
	Diameter of mounting pipe[3]	-	mm
	Blockage ratio of test object[4]	0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.6) °C, (62.3) %RH and (1007.6) hPa.

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
1) Mr. Sorayut Inaphat
2) Miss Mitsuorn Lertsanguan

Approved signatory .....
Mr. Patinya Boondhoomin
Calibration Department Manager

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE : 07/ 11/ 2026

Calibration procedure:
The Cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pilot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel type wind tunnel with 900 cm^2 cross test section area. The WI CL 007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate Number: NIMT-0055-25 and NIMT-0055-24

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data – Guide to the expression of uncertainty in measurement'

Remark:
[1] Blockage cross section area of the wind tunnel
[2] Projected cross section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2]/[1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Certificate Number
CWS-014-68

MEASUREMENT RESULTS [5]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pilot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below:

v_{ref}[6] (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	v_{uuc}[7] (m/s)	Error (m/s)	U (k=2) (m/s)
1.020	23.70	23.55	0.8	-0.2	0.31
2.162	23.42	23.55	2.0	-0.3	0.31
3.093	23.94	23.55	3.0	-0.1	0.31
4.358	23.90	23.55	3.9	-0.3	0.31
4.55	23.52	23.55	5.0	0.1	0.31
5.97	23.90	23.55	6.0	0.1	0.31
7.05	23.42	23.55	7.1	0.0	0.31
7.96	23.80	23.55	8.1	0.1	0.31
9.02	23.50	23.55	9.1	0.1	0.31
10.00	23.86	23.55	10.1	0.1	0.31
11.03	23.50	23.55	11.1	0.1	0.31
11.98	23.64	23.55	12.2	0.3	0.31
12.97	23.50	23.55	13.3	0.3	0.31
14.02	23.50	23.55	14.3	0.3	0.31
15.01	23.50	23.55	15.2	0.2	0.31
16.01	23.50	23.55	16.3	0.3	0.33

Remark:
[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[6] Velocity of standard
[7] Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. the Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.

End of Certificate of Calibration

JIRANATEE ASSOCIATES CO.,LTD.

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CALIBRATION 0367

Wind direction measurement laboratory
Calibration services department

NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWD-014-68

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM	: Wind Direction Sensor	
MANUFACTURER	: Novalynx	
MODEL/TYPE	: Sensor: WS-02F Data logger: 200-WS-25LB	
SERIAL NUMBER	: Sensor: WSD-A5191 Data logger: A5191	
ID NUMBER	: RYG_FS0328	
CONDITION AS-RECEIVED	: Used item	
CUSTOMER	: ALS laboratory group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.	
RECEIVED DATE	: 18 Apr 2025	
MEASUREMENT DATE	: 08 May 2025	
ISSUE DATE	: 09 May 2025	

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION			
	: Wind tunnel cross-section area[1]	900	cm^2
	Wind direction frontal area[2]	129	cm^2
	Diameter of mounting pipe[3]	-	mm
	Blockage ratio of test object[4]	0.143	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.2)°C, (43.8) %RH and (1006.4) hPa.

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
1) Mr. Sorayut Inaphat
2) Miss Mitsuorn Lertsanguan

Approved signatory .....
Mr. Patinya Boondhoomin
Calibration Department Manager

Calibration procedure:
The wind direction sensor was calibrated against Standard Rotary Encoder, model: AKD005S-DM04-F3.5-E0-0 in an close test-section of Eiffel type wind tunnel with 900 cm^2 cross test section area. The WI CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: IM-0077-24.

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data – Guide to the expression of uncertainty in measurement'

Remark:
[1] Blockage cross section area of the wind tunnel
[2] Projected cross section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [2]/[1]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Certificate Number
CWD-014-68

MEASUREMENT RESULTS [5]

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below:

Air speed m/s	D'_{std} Degree (°)	D'_{uuc} Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.01	45.000	40	-5	0.80
	90.000	85	-5	0.80
	135.000	130	-5	0.80
	180.000	179	-1	0.80
	225.000	228	3	0.80
	270.000	274	4	0.80
	315.000	319	4	0.80
	360.000	359	-1	0.80

Remark:
[5] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[6] Direction of standard
[7] Direction of Unit Under Calibration

End of Certificate of Calibration

JIRANATEE ASSOCIATES CO.,LTD.

JNAC
JIRANATEE ASSOCIATES CO.,LTD.

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NSC-TISI-TIS 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department

ilac-MRA
NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number
CWS-007-68

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM	: Cup anemometer	
MANUFACTURER	: Novalynx	
MODEL/TYPE	: Sensor: WS-02FA	
	Data logger: 110-WS-2501-D	
SERIAL NUMBER	: Sensor: WSD-A5988	
	Data logger: A5988	
ID NUMBER	: RYG_T50650	
CONDITION AS RECEIVED	: Used item	
CUSTOMER	: AIS laboratory group (Thailand) Co., Ltd	
	104 Phaithanakan 40, Phaithanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.	
RECEIVED DATE	: 17 Jan 2025	
MEASUREMENT DATE	: 07 Feb 2025	
ISSUE DATE	: 07 Feb 2025	

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

: Wind tunnel cross-section area[1]		900	cm^2
Wind direction frontal area[2]		100	cm^2
Diameter of mounting pipe[3]		-	mm
Blockage ratio of test object[4]		0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.5) °C, (55%) %RH and (1010.9) hPa.

TABULATION OF RESULTS:
The table on next page give the measured values

Calibration procedure:
The Cup anemometer was calibrated against Standard air velocity transducer no. 6135/12 and pitot tube with precision differential pressure meter model: DWM500-N in accordance with an Eiffel type wind tunnel with 900 cm² cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate Number: MW 0003.24 and MW 0065.24

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Approved signatory: .....
Mr. Patinya Boonchanon
Calibration Department Manager

Calibrated by:
1) Mr. Sorawit Thongtan
2) Miss Ithaporn Lertsomchai

REVIEW BY: .....
APPROVED BY: .....
NEXT CAL DATE: 07/ 08/ 26

Remark:
[1] Nozzle cross section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [1] to [2]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Certificate Number
CWS-007-68

MEASUREMENT RESULTS [1]

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 30 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the power plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V_{std} [2] (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V_{UUC} [3] (m/s)	Error (m/s)	*U (k=2)* (m/s)
1.814	24.54	24.50	0.8	-0.2	0.33
2.235	24.62	24.50	2.0	-0.2	0.33
3.067	24.40	24.50	2.9	-0.1	0.33
4.272	24.44	24.50	3.9	-0.3	0.33
4.93	24.40	24.50	4.9	0.0	0.33
5.96	24.66	24.50	5.9	-0.1	0.33
7.03	24.22	24.50	6.9	-0.1	0.33
7.97	24.60	24.50	8.0	0.0	0.33
9.02	24.40	24.50	9.1	0.0	0.33
9.96	24.66	24.50	9.9	-0.1	0.33
11.02	24.12	24.50	11.1	0.1	0.33
12.01	24.60	24.50	12.1	0.1	0.33
13.00	24.10	24.50	13.1	0.1	0.33
14.00	24.42	24.50	14.1	0.1	0.33
15.05	24.18	24.50	15.3	0.2	0.33
15.99	24.28	24.50	16.2	0.2	0.33

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Velocity of standard
[3] Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to bringing geometry.

End of Certificate of Calibration

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Wind direction measurement laboratory
Calibration services department

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CALIBRATION 0367

Certificate Number
CWD-007-68

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM	: Wind Direction Sensor	
MANUFACTURER	: Novalynx	
MODEL/TYPE	: Sensor: WS-02FA	
	Data logger: 110-WS-2501-D	
SERIAL NUMBER	: Sensor: WSD-A5988	
	Data logger: A5988	
ID NUMBER	: RYG_T50650	
CONDITION AS RECEIVED	: Used item	
CUSTOMER	: AIS laboratory group (Thailand) Co., Ltd.	
	104 Phaithanakan 40, Phaithanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.	
RECEIVED DATE	: 17 Jan 2025	
MEASUREMENT DATE	: 07 Feb 2025	
ISSUE DATE	: 07 Feb 2025	

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION

: Wind tunnel cross-section area[1]		900	cm^2
Wind direction frontal area[2]		129	cm^2
Diameter of mounting pipe[3]		-	mm
Blockage ratio of test object[4]		0.143	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.3)°C, (55.5) %RH and (1007.1) hPa

TABULATION OF RESULTS:
The table on next page give the measured values

Calibration procedure:
The wind direction sensor was compared against Standard Rotary Encoder, model: AS10(19-0004 P3.5 v1) in an open test section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate Number: MA 0027.24

Uncertainty of Measurement
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Approved signatory: .....
Mr. Patinya Boonchanon
Calibration Department Manager

Calibrated by:
1) Mr. Sorawit Thongtan
2) Miss Ithaporn Lertsomchai

Remark:
[1] Nozzle cross section area of the wind tunnel
[2] Projected cross-section area of the tested object include mounting pipe
[3] Diameter of mounting pipe
[4] Ratio [1] to [2]

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Certificate Number
CWD-007-68

MEASUREMENT RESULTS [1]

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (around 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are supplied in the table below.

Air speed m/s	D'_{std} Degree (°)	D'_{UUC} Degree (°)	Error Degree (°)	*U (k=2)* Degree (°)
	45.000	41	4	0.80
	90.000	86	4	0.80
	135.000	132	3	0.80
4.98	180.000	180	0	0.80
	225.000	229	-3	0.80
	270.000	274	-4	0.80
	315.000	319	-4	0.80
	360.000	359	1	0.80

Remark:
[1] Calibration results only count for the tested circumstances and environmental conditions during which calibration took place
[2] Direction of standard
Direction of Unit Under Calibration

End of Certificate of Calibration

Jiranatee Associates Co., Ltd.

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CALIBRATION 0367

Temperature measurement laboratory
Calibration services department.

NSC – TISI – TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-046-68

MEASUREMENT ITEM	: Data Logger with Temperature sensor
MANUFACTURER	: Novalynx
MODEL/TYPE	: 110-WS-250L-D
SERIAL NUMBER	: A5988
ID NUMBER	: RYG_FS0650
CONDITION AS-RECEIVED	: Used item
CUSTOMER	: ALS laboratory group (thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 17 Jan 2025
MEASUREMENT DATE	: 07 Feb 2025
ISSUE DATE	: 07 Feb 2025

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH

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

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibration procedure:
The temperature calibration was done by In House calibration Method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability:
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0047-24, Certificate number: EH-0113-24

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09, Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 21 Oct 2025

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM "Evaluation of measurement data - Guide to the expression of uncertainty in measurement"

Calibrated by:
☐ Mr. Sorawit Thachalad
☑ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit

Approved signatory: .....
Mr. Parinya Boonchanuon
Calibration Department Manager

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Jiranatee Associates Co.,Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number CDT-046-68

Result of Calibration: ☑ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:
Table 1: This equipment was connected with temperature sensor Model: HMP60 S/N: V1920215. Dimension: Diameter 12 mm. Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.080	19.8	-0.3	0.099
80	25.061	24.8	-0.3	0.099
80	30.043	29.7	-0.3	0.099
80	35.040	34.7	-0.3	0.099
80	40.021	39.7	-0.3	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration

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Relative humidity and Air Temperature measurement laboratory
Calibration services department

NSC – TISI – TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CRT-006-68

MEASUREMENT ITEM	: Relative humidity with data logger
MANUFACTURER	: Novalynx
MODEL/TYPE	: Data Logger: 110-WS-250L-D Sensor: HMP60
SERIAL NUMBER	: Data Logger: A5988 Sensor: V1920215
ID NUMBER	: RYG_FS0650
CONDITION AS-RECEIVED	: Used item
CUSTOMER	: ALS laboratory group (thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 17 Jan 2025
MEASUREMENT DATE	: 07 Feb 2025
ISSUE DATE	: 07 Feb 2025

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH

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

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibration procedure:
The Relative humidity and Air Temperature calibration was done by In House calibration method as WI-CL-009 and WI-CL-010 according to comparison method with Standard Chilled Mirror hygrometer with Temperature sensor and standard Humidity generator chamber.

Traceability:
The measurements are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT). Certificate number: TH-0146-24 and Jiranatee Associates Co., Ltd. Certificate number: CDT-026-68.

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM "Evaluation of measurement data - Guide to the expression of uncertainty in measurement"

Calibrated by:
☐ Mr. Sorawit Thachalad
☑ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit

Approved signatory: .....
Mr. Parinya Boonchanuon
Calibration Department Manager

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Jiranatee Associates Co.,Ltd.

JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number: CRT-006-68

Measurement Results:

The results of calibration and associated measurement uncertainties are reported in the table below.

Result of Calibration: ☑ Without Adjustment ☐ With Adjustment

Table 1: The results of calibration of relative humidity at 30 °C are reported in table below.
Calibration Range: 20%RH to 80%RH

Air Temperature (°C)	Standard Reading (%RH)	UUC Reading (%RH)	Error (%RH)	Uncertainty (%RH)
29.30	20.51	22.0	1.5	0.78
29.22	52.54	54.8	2.3	1.3
29.25	84.48	87.9	3.4	2.1

UUC*: Unit Under Calibration

End of Certificate of Calibration

JIRANATEE ASSOCIATES CO.,LTD.

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CALIBRATION 0367

Pressure measurement laboratory
Calibration services department.

NSC - TISI - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CPR-005-68

MEASUREMENT ITEM	: Digital barometer
MANUFACTURER	: Novalynx
MODEL/TYPE	: Sensor: 110-WS-25BP Data logger: 110-WS-250L-D
SERIAL NUMBER	: Sensor: BP-A5988 Data logger: A5988
ID NUMBER	: RYG_FS0650
CONDITION AS-RECEIVED	: Used item
CUSTOMER	: ALS laboratory group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	: 17 Jan 2025
MEASUREMENT DATE	: 07 Feb 2025
ISSUE DATE	: 07 Feb 2025

Calibration procedure:
The Digital barometer was calibrated against Digital pressure calibrator. The (WI-CT-001) was used as a calibration guideline.

Traceability:
The measurement results are traceable to the International system of units (SI) through the NIST (National Metrology Institute of Thailand) on Certificate number: MP 0009.24

Reference Used During Calibration:
1. Portable Pressure Transducer
Model: GPG2500, Serial No.: 41003260

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM "Evaluation of measurement data – Guide to the expression of uncertainty in measurement".

CONDITION OF THIS RESULT OF CALIBRATION:

1. Calibration effort for calibration sequence C
2. The UUC* was installed in vertical orientation above reference standard instrument and center of UUC* was used as the reference level.
3. Calibration conditions:
4. Condition : ☑ Normal ☐ Abnormal
   Pressure transmitting medium : Air
   ρ_a (20°C, 1 bar) : 1.19 kg/m³
   H_{amb} : (63.1±1.9) %
   t_{amb} : (23.1±0.3) °C
   P_{amb} : (1008.7±1.7) mbar
5. The certificate is valid only to the item calibrated on date and place of calibration

Calibrated by: (Mr.Apisit Singha) Field Services Scientist (4) Mrs.Siriporn Thongmalai

Approved signatory: Mr. Pornpop Boonsaraya, Calibration Department Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

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CALIBRATION 0367

Pressure measurement laboratory
Calibration services department.

NSC - TISI - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CPR-005-68

MEASUREMENT RESULTS : ☐ Without adjustment ☑ With adjustment

CALIBRATION IN THE RANGE OF : 950 mbar to 1050 mbar

The results of calibration and associated measurement uncertainties are reported in the table below.

STD (mbar)	UUC* (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
950.02	951.4	1.4	0.37
970.13	971.0	0.8	0.37
990.04	990.8	0.7	0.37
1010.11	1010.4	0.2	0.37
1030.08	1029.9	0.2	0.37
1050.06	1049.5	0.6	0.37

Note: UUC* Unit Under Calibration
: To convert the result in report unit to Pa should be multiply by 100

End of certificate

Jiranatee Associates Co.,Ltd.

CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date: 6-Jan-26
Next Calibration Date: 06-Jun-26
Certificate No: C-060126-RYG_FS0316
Barometric Pressure (mm Hg):
Relative Humidity (%):
Temperature (C):

Console Control Meter Data
Dry Gas Meter ID: RYG_FS0315
Brand: APEX INSTRUMENT
Serial No: 1706091
Model No: XC-572-V

Reference Dry Gas Meter Data
Reference Dry Gas Meter ID:
Serial No:
Correction Factor (Y):
Next Calibration Date:

ΔH (mm H2O)	Θ Minutes	Reference Dry Gas Meter Calibrator Vol (Liters) Start	Vol (Liters) Stop	Vol (Liters) Total	Ti (°C)	Console Control - Orygen Meter Vol (Liters) Start	Vol (Liters) Stop	Vol (Liters) Total	Tf (°C)	Tf (°C)
10	12.30	150.01	0.00	150.01	29.0	230,758.0	230,909.0	150.80	27.0	27.0
25	9.48	150.15	0.00	150.15	29.0	233,615.6	233,767.0	150.60	28.0	28.0
50	8.57	150.15	0.00	150.15	30.0	234,091.4	234,081.0	150.40	29.0	29.0
100	4.33	150.03	0.00	150.03	30.0	234,550.0	234,336.2	149.80	31.0	31.0
150	3.07	150.44	0.00	150.44	31.0	234,844.0	234,994.0	150.00	32.0	32.0

Y = Ratio of reading of reference to dry gas meter. Tolerance for individual values ± 0.02 from average

ΔH@ = Orifice pressure differential, that equates to 21.24 m of air @ 25 C and 760 mm of mercury. +/-10%. Tolerance for individual values ± 5

Procedure: 40 CFR 60 APPENDIX A-8 - SEC 6.3 & 7

Calibrated by: (Mr. Apisit Singha) Field Services Scientist (4)

Approved by: (Mr. Natthapol Jiangwareesang) Field S

Page 1 of 1

DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	6 Jan 26	Ambient Temperature (°C)	27
Calibration sheet No. :	C-060126-RYG_FS0316	Relative Humidity (%) :	48.5
Digital Temperature ID :	RYG_FS0316	Reference Temperature ID	RYF_FS0681
Serial No. :	1302005	Serial No. :	201090014918
Model :	XC-572-V	Model :	DIGICON CC-VT-MS
		Next Calibrate :	16 Jan 27

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	27	2	±3	Pass
	50	53	3	±3	Pass
	100	103	3	±3	Pass
	150	153	3	±3	Pass
	200	203	3	±3	Pass
	250	253	3	±3	Pass
	300	303	3	±3	Pass
	500	503	3	±3	Pass
Probe	100	102	2	±3	Pass
	120	122	2	±3	Pass
	140	143	3	±3	Pass
Oven	100	103	-2	±3	Pass
	120	123	-3	±3	Pass
	140	143	3	±3	Pass
Filter	100	103	3	±3	Pass
	120	123	3	±3	Pass
	140	143	3	±3	Pass
Exit	0	0	0	±3	Pass
	10	12	2	±3	Pass
	20	22	2	±3	Pass
Meter	0	0	0	±3	Pass
	25	27	2	±3	Pass
	50	53	3	±3	Pass
AUX	0	0	0	±3	Pass
	25	28	3	±3	Pass
	50	53	3	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัดที่ยอมได้

Calibrated by : (Mr.Apisit Sing-ha) Field Scientist (4)

Approved by : Mr.Natthapol Jiangwareesang Specialist (1)

FORM NO.: F 08-027 REVISION NO.: 2 ISSUE DATE: 16/2/23

PROBE NOZZLE DIAMETER

CALIBRATION DATA SHEET

Calibration Date :	6 Jan 26	Nozzle Set ID. :	BKK_FS0319
Calibration Sheet No. : C-060126-BKK_FS0319		Vernier Caliper ID.:	BKK_FS0626

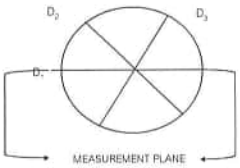
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	$(D_1 + D_2 + D_3) / 3$
	D_1	D_2	D_3	ΔD	D_{avg}
1	0.300	0.302	0.299	0.003	0.300
2	0.465	0.466	0.467	0.002	0.466
3	0.541	0.542	0.541	0.001	0.541
4	0.605	0.606	0.605	0.001	0.605
5	0.764	0.764	0.765	0.001	0.764
6	0.930	0.930	0.929	0.001	0.930
7	1.082	1.082	1.081	0.001	1.082
8	1.233	1.234	1.234	0.001	1.234
9	1.594	1.595	1.593	0.002	1.594

Where :

D_1, D_2, D_3 = There different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D_{avg} = $(D_1 + D_2 + D_3) / 3$

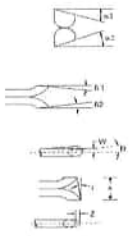


Calibrated by : _____ (Mr.Apisit Singha) Field Scientist (4)

Approved by : _____ Mr.Natthapol Jiengwareewong Field Specialist (1)

Type S Pitot Tube Calibration

Date Calibration	6-Jan-26	**Due Date**	6-Jul-26
Pitot ID	RYG_FS0320	**Inclinometer ID**	BKK_FS1131
Pitot SN		**Vernier ID**	RYG_FS0539



Parameter	Value	Allowable Range	Check
α1	0.6	-10° < α1 < +10°	OK
α2	1.3	-10° < α2 < +10°	OK
β1	0.4	-5° < β1 < +5°	OK
β2	0.8	-5° < β2 < +5°	OK
γ	0.9	-	-
θ	1.1	-	-
Z = A tan γ	0.013	Z ≤ 0.125"	OK
W = A tan θ	0.016	W ≤ 0.031"	OK
Dt	0.300	0.188" to 0.375"	OK
A/2Dt	1.372	1.05 ≤ PA/Dt ≤ 1.5	OK
A	0.823	2.1Dt ≤ A ≤ 3Dt	OK

Certify that pitot tube/porbe meets or exceeds all specifications, crierla and/or applicable design features and is hereby assigned a pitot tube certification fact of 0.84 . See 40 CFR Pt. 60, App. A,EPA Method 2.

Calibrated by : _____ (Mr. Saksit Phaisanphisut) RYG Field Services Scientist (4)

Approved By : _____ (Mr.Natthapol Jiengwareewong) RYG Field Services Specialist (1)

FORM NO.: F 06-124 REVISION NO.: 0 ISSUE DATE: 25/12/23

ENTECH Where Solutions Begin

Calibration Certificate

Certificate No: G 260304
Date of issue : 08-May-26

Instrument description	:	Flue Gas Analyzer
Instrument model	:	Testo 350
Instrument serial no.	:	62985049/1121
Control unit serial no.	:	03580182/1121
ID no. or control no.	:	RYG_FS0504
Manufacturer	:	Testo SE & Co. KGaA
Probe description	:	-
Probe model	:	-
Probe serial no.	:	-
Customer name	:	ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address	:	104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate :		2 Pages
Receiving no.	:	L-261141
Receiving date.	:	23-Apr-26
Parameter of calibration	:	Gas Calibration(Oxygen, Carbon Monoxide, Nitrogen Dioxide, Nitric Oxide, Sulphur Dioxide)
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
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 reproduced 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 traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 08-May-26

REVIEW BY
APPROVED BY
NEXT CAL DATE 07/ 05/ 2027

Mr. Kwanchai Khamdoung
Calibration Technician

Mrs. Nongluck Wongsettee
Technical Manager

FM-CL-09-C Rev.8 Page 1 of 2 Issued Date 26/02/16

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

ENTECH Where Solutions Begin

Calibration Certificate

Certificate No.: G 260304

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.506 % Vol	1287/25	Linde	08-May-29
Oxygen (O2) 9.984 % Vol	CG-0090-25	Nimt	24-Jun-30
Oxygen (O2) 21.01 % Vol	CG-0112-24	Nimt	01-Aug-29
Carbon monoxide (CO) 80.47 ppm	3276/25	Linde	09-Nov-27
Carbon monoxide (CO) 300.9 ppm	1422/25	Linde	21-May-29
Carbon monoxide (CO) 1000 ppm	3131/25	Linde	27-Oct-29
Nitrogen Dioxide (NO2) 30.68 ppm	2832/24	Linde	08-Sep-26
Nitrogen Dioxide (NO2) 81.32 ppm	3246/25	Linde	09-Nov-27
Nitrogen Dioxide (NO2) 202.4 ppm	0029/26	Linde	04-Jan-28
Nitric Oxide (NO) 29.8 ppm	CG-0145-25	Nimt	27-Oct-27
Nitric Oxide (NO) 151.8 ppm	0404/25	Linde	09-Feb-27
Nitric Oxide (NO) 322 ppm	1234/25	Linde	04-May-27
Sulphur Dioxide (SO2) 50.4 ppm	1306/25	Linde	12-May-27
Sulphur Dioxide (SO2) 100.7 ppm	2662/24	Linde	25-Aug-26
Sulphur Dioxide (SO2) 605.9 ppm	1229/25	Linde	04-May-27

Measured room conditions
Temperature : 24.5 °C Humidity : 59.7 %RH Pressure : 1009.4 mbar

Calibration conditions
Gas Temperature : 24 °C Flow rate : 1,300 ml/min Gas pressure : 1016.8 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.506	2.44	-0.066	0.15
O2 (%Vol)	9.984	9.93	-0.054	0.20
O2 (%Vol)	21.01	21.14	0.13	0.30
CO (ppm)	80.47	81	0.53	3.0
CO (ppm)	300.9	304	3.1	6.0
CO (ppm)	1000	1006	6	12
NO2 (ppm)	30.68	28.7	-1.98	8.0
NO2 (ppm)	81.32	79.2	-2.12	8.0
NO2 (ppm)	202.4	199.6	-2.8	12
NO (ppm)	29.8	32	2.2	8.0
NO (ppm)	151.8	155	3.2	8.0
NO (ppm)	322	327	5	12
SO2 (ppm)	50.4	49	-1.4	6.0
SO2 (ppm)	100.7	101	0.3	6.0
SO2 (ppm)	605.9	608	2.1	13

Remark : 1 cmol/mol = 1 %vol, 1 µmol/mol = 1 ppm, Sensor(O2, CO, NO2)New.

End of Certificate of Calibration

FM-CL-09-C Rev.8 Page 2 of 2 Issued Date 26/02/16

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

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7 139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Address : 184 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 25-AFM-208

Request No : Req-2025-1986

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Mesa Labs

Sensor Model : -

Model : 200-510M

Sensor Serial Number : -

Serial Number : 151114

Instrument Status : Used

ID : BKK_FS0614

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 3 September 2025

Calibration Date : 10 September 2025

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

REVIEW BY:

APPROVED BY:

NEXT CAL DATE: 09/09/26

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	6 May 2026
Temperature meter	GT 11	08000057	Qrohms	15 October 2025
Pressure meter	CPG2400	41000KDU651882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01 and MET/NSC-TISI-TIS Accreditation No. 0052

Note :

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

Calibration By : Mr. Noppadon Luangsri, Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn, Calibration Engineer Supervisor

Issue Date : 10 September 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7 139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate No : 25-AFM-208

Request No : Req-2025-1986

Result of Calibration : Without Adjustment

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

Note STD : Standard UUC : Unit Under Calibration

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

$$Qmeas = \mathrm{Qref}\, x \frac{\mathrm{Pref}}{\mathrm{Pmeas}} x \frac{\mathrm{Tmeas}}{\mathrm{Tref}}$$

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

* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.06 Issue date 21/2/25

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7 139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Address : 184 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 25-AFM-207

Request No : Req-2025-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Mesa Labs

Sensor Model : -

Model : 200-510I

Sensor Serial Number : -

Serial Number : 130026

Instrument Status : Used

ID : BKK_FS0610

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 3 September 2025

Calibration Date : 10 September 2025

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

REVIEW BY:

APPROVED BY:

NEXT CAL DATE: 09/09/26

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	6 May 2026
Temperature meter	GT 11	08000057	Qrohms	15 October 2025
Pressure meter	CPG2400	41000KDU651882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01 and MET/NSC-TISI-TIS Accreditation No. 0052

Note :

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

Calibration By : Mr. Noppadon Luangsri, Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn, Calibration Engineer Supervisor

Issue Date : 10 September 2025

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.06 Issue date 21/2/25

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7 139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate No : 25-AFM-207

Request No : Req-2025-1987

Result of Calibration : Without Adjustment

STD Reading			UUC Readiung			Error	Uncertainty		
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)	(cc/min)	(cc/min)	(°C)	(kPa)
25.3	100.99	20	-	-	20.042	0.0	1.6	1.0	0.50
25.5	100.90	50	-	-	49.921	-0.1	4.0	1.0	0.50
25.5	100.91	100	-	-	100.09	0.1	3.8	1.0	0.50
25.4	100.86	150	-	-	150.34	0.3	5.4	1.0	0.50
25.6	100.93	199	-	-	200.17	1.2	7.2	1.0	0.50
25.6	100.95	201	-	-	200.05	-1	11	1.0	0.50
25.7	100.96	402	-	-	401.03	-1	14	1.0	0.50
25.7	100.95	503	-	-	500.26	-3	10	1.0	0.50

Note STD : Standard UUC : Unit Under Calibration

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

$$Qmeas = \mathrm{Qref}\, x \frac{\mathrm{Pref}}{\mathrm{Pmeas}} x \frac{\mathrm{Tmeas}}{\mathrm{Tref}}$$

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

* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.06 Issue date 21/2/25

ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Phatthanakan, Suan Luang, Bangkok 10250
T +66 2 760 3000 F +66 2 760 3197

Certificate of Calibration

Certificate No C-030426-RYG_FS0690

Air Sampling Pump Detail

Equipment name	: Personal Air Sampling Pump	Equiment ID	: RYG_FS0690
Brand	: Gilian	Serial No.	: 20221010024
Model/Type	: GilAir Plus	Calibration Date	: 03-Apr-26
		Next calibration date	: 03-Jul-26

Reference Standard Low Flow Meter

Equipment name	: Air Flow Meter	Equiment ID	: BKK_FS0619
Brand	: MesaLabs	Serial No.	: 130026
Model/Type	: Defender 510-L	Calibration Date	: 10-Sep-25
		Due Date	: 09-Sep-26

Reference Standard High Flow Meter

Equipment name	: Air Flow Meter	Equiment ID	: BKK_FS0614
Brand	: MesaLabs	Serial No.	: 151114
Model/Type	: Defender 510-M	Calibration Date	: 10-Sep-25
		Due Date	: 09-Sep-26

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min) 1	2	3	Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
Low Flow							
20	20.3	20.4	20.3	20.3	5%	19 - 21	Passed
50	49.2	49.1	49.4	49.2	5%	48 - 53	Passed
100	100.8	99.2	98.6	99.5	5%	95 - 105	Passed
200	201.0	199.8	201.8	200.9	5%	190 - 210	Passed
High Flow							
500	507.7	508.7	509.2	508.5	3%	485 - 515	Passed
1000	1012.9	1004.3	1011.4	1009.5	3%	970 - 1030	Passed
2000	2001.1	1994.0	1993.9	1996.3	3%	1940 - 2060	Passed
2500	2499.5	2499.9	2497.0	2498.8	3%	2425 - 2575	Passed
4000	4021.5	4018.6	4010.5	4016.9	3%	3880 - 4120	Passed

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

Calibrated By: (Mr. Natchapon Thamklang)
RYG Field Services Scientist (1)

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

Issue date : 04-Apr-26

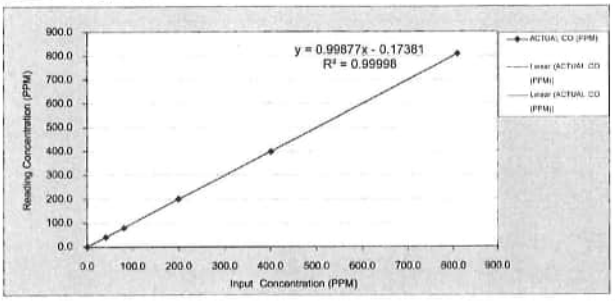
MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co.Ltd. (สาขาระยอง)		
EQUIPMENT NAME : CO Analyzer		
MANUFACTURER : Teledyne - API	MODEL : T300	SERIAL NO : 1215
STANDARD GAS CONCENTRATION (PPM) :	808.9	CERTIFIED DATE : CC739972
CYLINDER PRESSURE (psig) :	900	CERTIFIED DATE : Nov .05 ,2020
CERTIFIED BY : AIRGAS SPECIALTY GASES		EXPIRED DATE : Nov .05, 2028

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.008	0.008	-
1	40.00	40.015	0.015	0.038
2	80.00	79.445	-0.555	-0.694
3	199.20	200.083	0.883	0.443
4	400.60	397.683	-2.917	-0.728
5	808.90	808.538	-0.362	-0.045
		AVERAGE (%)		0.390

REVIEW BY Thanita K.
APPROVED BY
NEXT CAL. DATE 5 Jul 2026



CALIBRATED BY : คุณธนาคม มหาธาง | DATE : 3 กรกฎาคม 2568

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณธนาคม มหาธาง โทรศัพท์ : 02-515-8997

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.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : ALS Laboratory Group (Thailand) Co.Ltd. (สาขาระยอง) | วันที่ : 3 กรกฎาคม 2568
รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer | บริษัทผู้ผลิต : Teledyne API
รุ่นของอุปกรณ์ / เครื่องมือ : T300 | หมายเลขอุปกรณ์ / เครื่องมือ : 1215

TEST VALUES				
	API MODEL T300		BEFORE	AFTER
1	RANGE	1 - 1000 PPM	100	100
2	STABILITY	≤ 1 PPM	0.015	0.009
3	CO MEASURE	3500 - 4800 mV	3210.3	3640.6
4	CO REFERENCE	2000 - 4800 mV	2960.3	3011.2
5	MR RATIO	1.1 - 1.3	1.220	1.218
6	PRESSURE	25 - 35 in - Hg-A	29.1	29.0
7	SAMPLE FLOW	800 ± 10% cc/min	813	799
8	SAMPLE TEMP	48 ± 5 °C	45.2	44.9
9	BENCH TEMP	48 ± 2 °C	47.3	49.0
10	IR BELL TEMP	68 ± 2 °C	68.3	68.3
11	BOX TEMP	AMBIENT ± 5 °C	31.7	31.9
12	PMT DRIVE	250 - 1750 mV	421.61	420.6
13	CO SLOPE	1.0 ± 0.3	0.845	0.994
14	CO OFFSET	0.0 ± 0.3	0.007	0.007
15	CO READING (AMBIENT)	PPM	0.454	0.333
16	VOLTAGES	15 V +12 V -15 V -15 V	5.22/12.18/-15.27/-15.29	5.22/12.18/-15.27/-15.34
17	ZERO GAS	0.00 PPM	0.060	0.005
18	SPAN GAS	40.00 PPM	41.440	40.015

หมายเหตุ
- ทำการเปลี่ยนไส้กรองเบอร์ SS, Filter 1 ชิ้น, O-ring 2 ชิ้น, Spring 1 ชิ้น, Sample Filter 47 mm. 1 ชิ้น
- ทำการ Calibrate Multi-Point

(คุณธนาคม มหาธาง)
ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณธนาคม มหาธาง โทรศัพท์ : 0-2515-8997
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

KINETICS

Customer service report

ALS Laboratory Group (Thailand) Co., Ltd.

Manufacturer	Equipment	Model
Teledyne API	CO Analyzer	T300
S/N	**Quotation**	
1215	-	

● Checking Date ●
3/07/2025

● Problem
- Preventive Maintenance





B2

contact us

● Correlation working / Remark
1. ทำการเปลี่ยน Sintered Filter , O-ring , Spring
2. ทำการเปลี่ยน Sample Filter 47 mm
3. ทำการ Calibrate Multi - Point

● Repair parts ●
1. Sintered Filter 1 ชิ้น
2. O-ring 2 ชิ้น
3. Spring 1 ชิ้น
4. Filter 47 mm 1 ชิ้น

Technician / Engineer Mr. Thanakorn

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

CERTIFICATE OF CALIBRATION

FOR

REVIEW BY ... Supt. S.
APPROVED BY ...
NEXT CAL DATE... 07/07/2027

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	DWYER
MODEL / TYPE	:	DPGA-00
SERIAL NO.	:	DVG06[BKK_FS0479]
CLID. NO.	:	212300278
JOB CONTROL NO.	:	260107001113
CALIBRATION SERVICE	:	☑ IN-LABORATORY ☐ ON-SITE

CUSTOMER : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN RD.,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK 10250, THAILAND

DATE OF RECEIVED : 07 January 2026 DATE OF ISSUED : 09 January 2026

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

Calibrated By : Sittipong Pimdee
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
09 January 2026

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

@clccalibration

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

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	DWYER
MODEL / TYPE	:	DPGA-00
SERIAL NO.	:	DVG06[BKK_FS0479]
DATE OF CALIBRATION	:	08 January 2026

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 10) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPPP-05 according to DKD-R 6-1 as calibration guidelines.
The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 741B S/N. 8295020 with Pressure Module Model 700PV4 S/N. 19298401.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Certificate No. MP-0211-25, Due Date 19 August 2026.

UNCERTAINTY :

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

@clccalibration

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

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

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

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (inHg)	STD Reading (kPa)		Conversion to inHg		Correction (inHg)	
	Up	Down	Up	Down	Up	Down
0.00	0.000	0.000	0.000	0.000	0.000	0.000
-10.00	-33.887	-33.890	-10.007	-10.008	-0.007	-0.008
-20.00	-67.761	-67.764	-20.010	-20.011	-0.010	-0.011
-26.00	-88.090	-88.093	-26.013	-26.014	-0.013	-0.014
-27.00	-91.483	-91.483	-27.015	-27.015	-0.015	-0.015

Uncertainty of measurement ± 0.036 inHg

Technical Note, Transmitting fluid : Air.

Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 017 Page 46 of 73

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

End of Certificate

@clccalibration

DKSH

Certificate of Calibration

Equipment:	SPECTROPHOTOMETER	Certificate No.:	C06250108
Model:	DR6000	Issued Date:	18 March 2025
Serial No. (or ID.):	1627845 (RYG_EN0037)	Job No.:	WO-00064379
Manufacturer:	HACH	Page:	1 of 3
Condition:	In Condition		

Customer: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand.

Received By: Pholchanan
APPROVED BY: D.
NEXT CAL. DATE: 18/09/26

Environment Condition:	Temperature	24.4	°C	±	0.3 °C
	Humidity	60.8	%RH	±	3.5 %RH

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
(Wet Chemistry Lab)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr.Preecha Phooarsai
Calibration Date: 18 March 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. 111583 and 111584
The standard for Photometric Certificate No. 9114984 and 111588
The standard for Stray light Certificate No. 111586 and 111585
The standard for Spectral resolution Certificate No. 111587

(Mr. Preecha Phooarsai)
Person in charge

(Miss Kaewkan Suradech)
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.

DKSH Technology Limited
2533 Sukhumvit Road, Bangchan, Prasamchanong, Bangkok 10260
Phone: +66 2539 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - In Asia and Beyond.

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.5	0.11	0.13
536.66	536.7	-0.04	0.13
637.96	638.3	-0.32	0.13
748.48	748.8	-0.32	0.13
807.03	807.5	-0.47	0.13

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2930	0.291	0.0020	0.0045
	0.5168	0.518	-0.0012	0.0045
	1.0298	1.031	-0.0012	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2867	0.285	0.0017	0.0045
	0.5073	0.508	-0.0007	0.0045
	1.0063	1.009	-0.0007	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2516	0.250	0.0016	0.0045
	0.4595	0.461	-0.0015	0.0045
	0.9334	0.935	-0.0016	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2461	0.246	0.0001	0.0045
	0.4652	0.466	-0.0008	0.0045
	0.9466	0.948	-0.0012	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2594	0.259	0.0004	0.0045
	0.5040	0.505	-0.0010	0.0045
	1.0032	1.004	-0.0008	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2579	0.258	-0.0001	0.0045
	0.4971	0.497	0.0001	0.0045
	0.9720	0.973	-0.0010	0.0045

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงพระโขนงเหนือ เขตวัฒนา 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

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7355	0.738	-0.0025	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8574	0.857	0.0004	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2864	0.290	-0.0036	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6374	0.637	0.0004	0.0080

Stray light *

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.62 +/- 0.11 nm	260.6	1.7	1.770
391.44 +/- 0.11 nm	391.4	1.4	1.854

Spectral Resolution *

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.66	266.69	1.38	2.00
UUC: Wavelength (nm)	268.2	266.2		
Std Absorbance (A)	0.4566	0.2780		
UUC: Absorbance (A)	0.413	0.299		

* Calibration Marked * Not TISI Accredited * in this Certificate have been included for completeness.

The End of Certificate

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงพระโขนงเหนือ เขตวัฒนา กรุงเทพมหานคร 10260
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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00064379

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR6000 หมายเลขเครื่อง: 1627845

ตรวจสอบ (ริง) 18 Mar 2025 ปกติ	ตรวจสอบ (ริง) 18 Mar 2025 ไม่ปกติ	รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 18 Mar 2025 ปกติ	ตรวจสอบ (ส่ง) 18 Mar 2025 ไม่ปกติ	หมายเหตุ
		General			
☑	☐	1. ความสมบูรณ์เครื่อง	☑	☐	
☑	☐	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	☑	☐	
☑	☐	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Swicth)	☑	☐	
☑	☐	4. ปุ่มกด (Keypad)	☑	☐	
☑	☐	5. หน้าจอ (Display, Screen Contrast)	☑	☐	
		Spectrophotometer			
☐	☐	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	☐	☐	
☐	☐	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	☐	☐	
☑	☐	8. ความยาวคลื่น (Wavelength Check)	☑	☐	*
☑	☐	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	☑	☐	13.5 Hours
☑	☐	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	☑	☐	893.0 Hours
☑	☐	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	☑	☐	
		pH Meter and Conductivity Meter			
☐	☐	12. อิเล็คโทรด (Electrode and Connection Cable)	☐	☐	
☐	☐	13. ระดับสารละลายใน Electrode (Level KCl)	☐	☐	
☐	☐	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	☐	☐	
☐	☐	15. ขาจับอิเล็คโทรด (Stand)	☐	☐	
		Turbidimeter			
☐	☐	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	☐	☐	
☐	☐	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0)	☐	☐	
		Automatic titrator			
☐	☐	18. สภาพ Piston Burettes	☐	☐	
☐	☐	19. Function Rinsing and Dosing	☐	☐	
☐	☐	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	☐	☐	

เพิ่มเติมข้อแนะนำ : * 656.1nm = 656.1nm

* 486.0nm = 485.7nm

Mr.Preecha Phoosrsai

Service Engineer

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
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SARTORIUS

Accredited by

NSC-TISI-TIS 17025

Calibration 0426

NSC-TISI-TIS 17025 CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 25BKL0003

Object	Electronic non-automatic weighing instrument
Manufacturer	Sartorius
Type	MSU224S-100-DU
Serial | QM Ident. no.	31709552 | RYG_EN0003
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.
Order no.	2230
Number of pages	4
Date of calibration	20 Feb 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.

REVIEW BY Thanitak.

APPROVED BY

NEXT CAL DATE 20/02/26

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	Approval of the Calibration Certificate	Person in charge
06 Mar 2025	Mr. Chonchai Inthana	Kachen Lalee

Calibration object

Single range instrument

Model	MSU224S-100-DU
Serial Number	31709552
QM Ident. no | Inventory no.	RYG_EN0003 | —

Maximum capacity (Max. load)	220.0000 g
Measured range	220.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department | Cost center	Laboratory Department, | —
Building | Floor	— | 1st Floor,
Room	Balance Room,
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	24.7 °C | 0.3 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 62.3 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g | 200 g		
	10 g	200 g
1	10.0000 g	200.0000 g
2	10.0000 g	200.0001 g
3	9.9999 g	200.0000 g
4	10.0000 g	200.0000 g
5	10.0000 g	200.0001 g
6	9.9999 g	200.0000 g
7	10.0000 g	200.0000 g
8	10.0000 g	200.0000 g
9	10.0000 g	200.0000 g
10	10.0000 g	200.0001 g
	s = 0.00004 g	s = 0.00005 g

Eccentricity

Test load (nominal):	100 g
Center	100.0000 g
Front left	100.0000 g
Back left	100.0001 g
Back right	99.9999 g
Front right	99.9999 g
Maximum deviation from centric loading indication	
$\lvert\Delta I_{ecc}\rvert_{max}$ = 0.0001 g	

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty $U(E)$	Uncertainty relative $U_{rel}(E)$
0.0100 g	0.0100 g	0.0000 g	2.00	0.00012 g	1.2 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.026 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00013 g	0.0026 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00013 g	0.0013 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00068 %
50.0000 g	50.0000 g	0.0000 g	2.00	0.00015 g	0.00029 %
100.0000 g	100.0001 g	0.0001 g	2.00	0.00018 g	0.00018 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00028 g	0.00014 %
220.0000 g	220.0000 g	0.0000 g	2.00	0.00032 g	0.00015 %
Maximum error of indication		$\lvert E\rvert_{max}$ = 0.0001 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

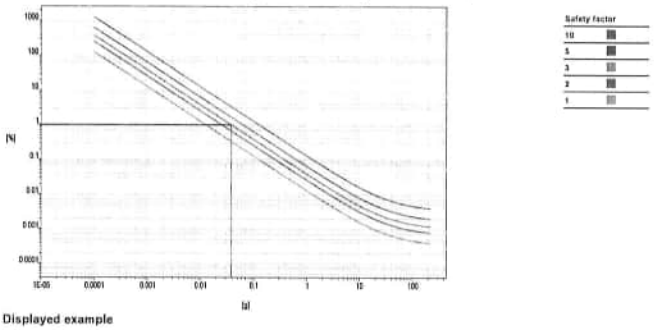
Uncertainty of measurement in use

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 $U_{gl}(W)$	$U_{gl}(W) = 0.00013\ g + 3.42 \cdot 10^{-4} \cdot R$

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 max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00014 g	0.0063 %
25 %	55.0000 g	0.00032 g	0.00058 %
50 %	110.0000 g	0.00051 g	0.00046 %
75 %	165.0000 g	0.00069 g	0.00042 %
100 %	220.0000 g	0.00088 g	0.00040 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0380 g

SARTORIUS

Accredited by

NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 26BCI0066

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSU224S-100-DU	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.
Serial | QM Ident. no.	31709552 | RYG_EN0003	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	278579	
Number of pages	4	
Date of calibration	03 Feb 2026	

RELEASED Thanitark
APPROVED
NEXT CAL DATE 03/02/27

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	Approval of the Calibration Certificate	Person in charge
03 Feb 2026	Mr. Chonchai Inthana	Chonchai Inthana

Calibration object

Single range instrument

Model	MSU224S-100-DU
Serial Number	31709552
QM Ident. no | Inventory no.	RYG_EN0003 | —
Maximum capacity (Max. load)	220.0000 g
Measured up to	220.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department | Cost center	Laboratory Department. | —
Building | Floor	— | 1st Floor.
Room	Balance Room.
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 H/T250743 (Traceable to SI unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M2508149S ,E2(Traceable to SI unit through TCS)	19 Aug 2027

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	03 Feb 2026
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	24.5 °C | 0.5 K
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 52.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g | 200 g

	10 g	200 g
1	10.0000 g	200.0000 g
2	10.0000 g	200.0001 g
3	10.0000 g	200.0001 g
4	10.0001 g	200.0001 g
5	10.0000 g	200.0001 g
6	10.0000 g	200.0000 g
7	10.0000 g	200.0000 g
8	10.0000 g	200.0000 g
9	10.0000 g	200.0000 g
10	10.0000 g	200.0000 g
	s = 0.00003 g	s = 0.00005 g

Eccentricity

Test load (nominal):	100 g
Center	100.0000 g
Front left	100.0000 g
Back left	99.9999 g
Back right	100.0000 g
Front right	100.0000 g

Maximum deviation from centric loading indication
$|\Delta I_{ecc}|_{max}$ = 0.0001 g

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty U(E)	Uncertainty relative $U_{rel}(E)$
0.0100 g	0.0100 g	0.0000 g	2.00	0.00010 g	1.0 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.027 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00014 g	0.0027 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00014 g	0.0014 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00071 %
50.0000 g	50.0001 g	0.0001 g	2.00	0.00015 g	0.00030 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00018 g	0.00018 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00028 g	0.00014 %
220.0000 g	220.0000 g	0.0000 g	2.00	0.00032 g	0.00015 %
Maximum error of indication		$\|E\|_{max}$ = 0.0001 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

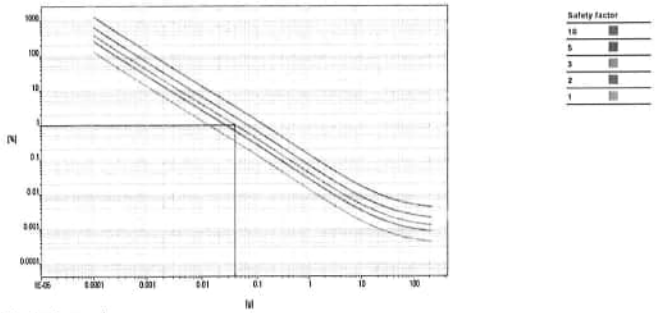
Uncertainty of measurement in use

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 $U_{gl}(W)$	$U_{gl}(W) = 0.00013\ g + 3.65 \cdot 10^{-6} \cdot R$

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 max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00014 g	0.0063 %
25 %	55.0000 g	0.00033 g	0.00060 %
50 %	110.0000 g	0.00053 g	0.00048 %
75 %	165.0000 g	0.00073 g	0.00044 %
100 %	220.0000 g	0.00093 g	0.00042 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0395 g

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NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 25BKL0006

Object	Electronic non-automatic weighing instrument
Manufacturer	Sartorius
Type	MSE125P-100-DU
Serial | QM Ident. no.	33108993 | RYG_EN0004
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.
Order no.	2230
Number of pages	4
Date of calibration	20 Feb 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-VM 08.

This certificate relate and apply this equipment only.

REVIEW BY Thanitak.
APPROVED BY
NEXT CAL DATE 20/02/26

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	Approval of the Calibration Certificate	Person in charge
06 Mar 2025	Mr. Chonchai Inthana	Kachen Lalee

Calibration object

Multi interval instrument

Model	MSE125P-100-DU	
Serial Number	33108993	
QM Ident. no | Inventory no.	RYG_EN0004 | —	
Range	1	2
Maximum capacity (Max. load)	60.00000 g	120.0000 g
Measured range	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 Department. | —
Building | Floor	— | 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	24.2 °C | 0.3 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 62.5 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 50 g | 100 g

	50 g	100 g
1	50.00002 g	100.0000 g
2	50.00001 g	100.0000 g
3	50.00003 g	100.0000 g
4	50.00002 g	100.0000 g
5	50.00001 g	100.0000 g
6	50.00002 g	99.9999 g
7	50.00002 g	100.0000 g
8	50.00001 g	100.0000 g
9	50.00001 g	100.0000 g
10	50.00002 g	100.0000 g
	s = 0.000007 g	s = 0.00003 g

Eccentricity

Test load (nominal):	50 g
Center	50.00002 g
Front left	50.00000 g
Back left	50.00000 g
Back right	50.00001 g
Front right	50.00003 g
Maximum deviation from centric loading indication	
$\lvert\Delta_{ecc}\rvert_{max}$ = 0.00002 g	

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty $U(E)$	Uncertainty relative $U_{rel}(E)$
0.01000 g	0.01000 g	0.00000 g	2.00	0.000024 g	0.24 %
0.10000 g	0.10000 g	0.00000 g	2.00	0.000037 g	0.037 %
1.00000 g	1.00000 g	0.00000 g	2.00	0.000037 g	0.0037 %
5.00002 g	5.00002 g	0.00000 g	2.00	0.000050 g	0.0010 %
20.00002 g	20.00002 g	0.00000 g	2.00	0.000069 g	0.00034 %
55.00004 g	55.00003 g	-0.00001 g	2.00	0.00017 g	0.00031 %
70.0000 g	70.0000 g	0.0000 g	2.00	0.00017 g	0.00024 %
80.0001 g	80.0001 g	0.0000 g	2.00	0.00018 g	0.00023 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00017 g	0.00017 %
110.0000 g	110.0000 g	0.0000 g	2.00	0.00028 g	0.00025 %
120.0000 g	119.9999 g	-0.0001 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

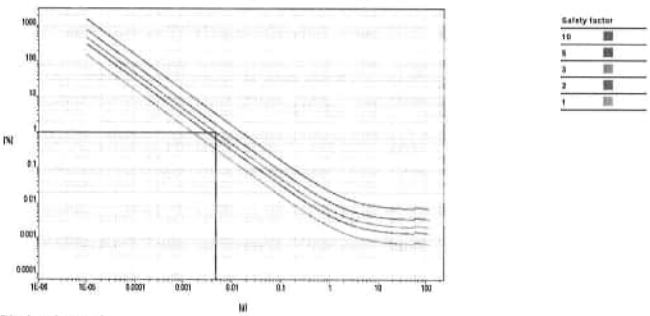
Uncertainty of the weighing result $U_{gl}(W)$

Partial weighing range 1 | 0.00000 g...60.00000 g	$U_{gl}(W) = 0.000016\ g + 6.61 \cdot 10^{-6} \cdot R$
Partial weighing range 2 | 60.00000 g...120.0000 g	$U_{gl}(W) = 0.000086\ g + 6.19 \cdot 10^{-6} \cdot R$

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	0.000020 g	0.0033 %
25 %	15.00000 g	0.00012 g	0.00077 %
50 %	30.00000 g	0.00021 g	0.00071 %
75 %	45.00000 g	0.00031 g	0.00070 %
100 %	60.00000 g	0.00041 g	0.00069 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.00474 g

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NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 26BCI0069

Object	Electronic non-automatic weighing instrument
Manufacturer	Sartorius
Type	MSE125P-100-DU.
Serial | QM Ident. no.	33108993 | RYG_EN0004
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand.
Order no.	278579
Number of pages	6
Date of calibration	03 Feb 2026

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.

REVIEW BY Thanitak.
APPROVED BY
NEXT CAL DATE 03/02/27

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	Approval of the Calibration Certificate	Person in charge
03 Feb 2026	Mr. Chonchai Inthana	Chonchai Inthana

Calibration object

Multi range instrument

Model	MSE125P-100-DU	
Serial Number	33108993	
QM Ident. no | Inventory no.	RYG_EN0004 | —	
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 Department. | —
Building | Floor	— | —
Room	Laboratory Room.
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 H/T250743 (Traceable to Si unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M25081495 ,E2(Traceable to SI unit through TCS)	19 Aug 2027

Range 1

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	03 Feb 2026
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	24 °C | 0.5 K
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 54.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 60 g	
	60 g
1	50.00001 g
2	50.00001 g
3	50.00000 g
4	50.00001 g
5	50.00002 g
6	50.00001 g
7	50.00001 g
8	50.00002 g
9	50.00001 g
10	50.00000 g
	s = 0.000007 g

Eccentricity

Test load (nominal):	60 g
Center	50.00001 g
Front left	50.00001 g
Back left	50.00001 g
Back right	50.00001 g
Front right	50.00000 g
Maximum deviation from centric loading indication $\lvert\Delta I_{ecc}\rvert_{max}$ = 0.00001 g	

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty U(E)	Uncertainty relative $U_{rel}(E)$
0.01000 g	0.01000 g	0.00000 g	2.00	0.000024 g	0.24 %
0.05000 g	0.05000 g	0.00000 g	2.00	0.000024 g	0.048 %
0.10000 g	0.10000 g	0.00000 g	2.00	0.000037 g	0.037 %
0.50000 g	0.50000 g	0.00000 g	2.00	0.000037 g	0.0074 %
1.00000 g	1.00000 g	0.00000 g	2.00	0.000037 g	0.0037 %
2.00003 g	2.00003 g	0.00000 g	2.00	0.000050 g	0.0025 %
5.00002 g	5.00002 g	0.00000 g	2.00	0.000050 g	0.0010 %
10.00001 g	10.00001 g	0.00000 g	2.00	0.000069 g	0.00069 %
19.99999 g	20.00000 g	0.00001 g	2.00	0.000069 g	0.00035 %
50.00001 g	50.00001 g	0.00000 g	2.00	0.000091 g	0.00018 %
57.00005 g	57.00006 g	0.00001 g	2.00	0.00017 g	0.00030 %
Maximum error of indication		$\lvert E\rvert_{max}$ = 0.00001 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.

Range 2

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	03 Feb 2026
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	24 °C | 0.5 K
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 54.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 100 g	
	100 g
1	100.0000 g
2	100.0000 g
3	100.0000 g
4	99.9999 g
5	100.0000 g
6	100.0000 g
7	100.0000 g
8	100.0000 g
9	100.0000 g
10	100.0000 g
	s = 0.00003 g

Eccentricity

Test load (nominal):	60 g
Center	50.00001 g
Front left	50.00001 g
Back left	50.00001 g
Back right	50.00001 g
Front right	50.00000 g
Maximum deviation from centric loading indication $\lvert\Delta I_{ecc}\rvert_{max}$ = 0.00001 g	

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty U(E)	Uncertainty relative $U_{rel}(E)$
10.00001 g	10.00001 g	0.00000 g	2.00	0.000069 g	0.00069 %
65.0000 g	65.0000 g	0.0000 g	2.00	0.00017 g	0.00026 %
70.0000 g	70.0000 g	0.0000 g	2.00	0.00017 g	0.00024 %
75.0000 g	75.0000 g	0.0000 g	2.00	0.00018 g	0.00023 %
80.0000 g	80.0000 g	0.0000 g	2.00	0.00018 g	0.00023 %
85.0000 g	85.0000 g	0.0000 g	2.00	0.00021 g	0.00025 %
90.0000 g	90.0000 g	0.0000 g	2.00	0.00019 g	0.00021 %
95.0000 g	95.0000 g	0.0000 g	2.00	0.00022 g	0.00023 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00017 g	0.00017 %
110.0000 g	110.0000 g	0.0000 g	2.00	0.00026 g	0.00025 %
120.0000 g	120.0000 g	0.0000 g	2.00	0.00028 g	0.00023 %
Maximum error of indication		$\lvert E\rvert_{max}$ = 0.0000 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

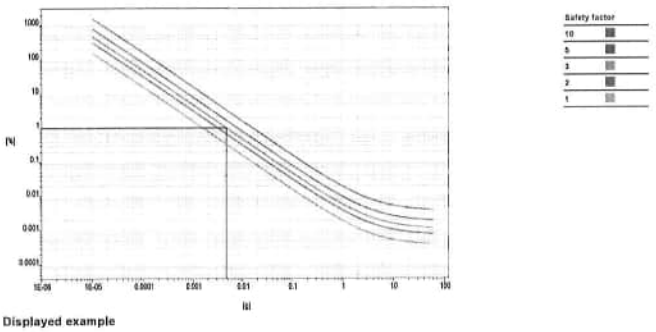
Range 1

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	$2 \cdot 10^{-6}$/K
Uncertainty of the weighing result $U_{gl}(W)$	$U_{gl}(W) = 0.000016\ g + 3.70 \cdot 10^{-6} \cdot R$

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 max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	0.60000 g	0.000018 g	0.0030 %
25 %	15.00000 g	0.000072 g	0.00048 %
50 %	30.00000 g	0.00013 g	0.00042 %
75 %	45.00000 g	0.00018 g	0.00041 %
100 %	60.00000 g	0.00024 g	0.00040 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.00470 g

Uncertainty of measurement in use

Range 2

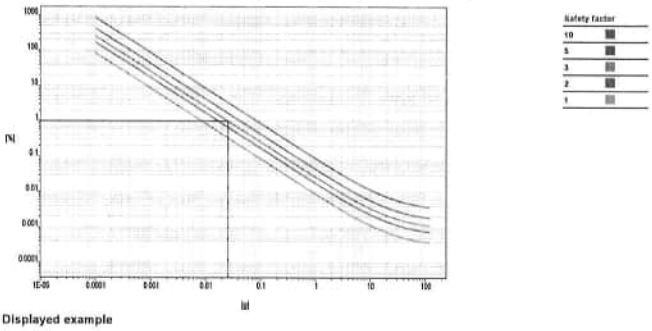
Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	$2 \cdot 10^{-6}$/K

Uncertainty of the weighing result $U_{gl}(W)$ $U_{gl}(W) = 0.000086\ g + 3.00 \cdot 10^{-6} \cdot R$

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 max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	1.20000 g	0.000090 g	0.0075 %
25 %	30.00000 g	0.00018 g	0.00059 %
50 %	60.00000 g	0.00027 g	0.00044 %
75 %	90.0000 g	0.00036 g	0.00040 %
100 %	120.0000 g	0.00045 g	0.00038 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.02577 g

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REVIEW BY ..... Agilent CrossLab Compliance Services
APPROVED BY .....
CAL. DATE 21 Oct 26

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID:	GM-3
Organization Name:	ALS Laboratory Group (Thailand) Co Ltd.
Organization Location:	104 Phattanakan40, Suan Luang, Bangkok 10250
Date:	October 22, 2025 5:02:28 PM
EQP Name:	AgilentRecommended , AgilentRecommended
EQP Revision:	GC.02.52, GCMS.02.53
Overall Qualification Status:	Pass

CDS Logon Verification - GC

Logon: asbkk, env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: **Pass**

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setpoint Status: **Pass**

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.61	psi

Accuracy: 0.6 psi
Agilent Recommended: <= 1.2

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: **Pass**

Zone: Oven

	Setpoint/Actual				
Temperature:	230.0	231.4	°C		
Accuracy:		1.4	°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	101.4	°C		
Accuracy:		1.4	°C		
Agilent Recommended:	>=	-1.0	% setpoint in K	(-3.7	°C)
	<=	1.0	% setpoint in K	(3.7	°C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: **Pass**

	Setpoint/Average		
Temperature:	100.0	101.4667	°C
Stability:		0.1	°C
Agilent Recommended:	<=	0.5	

Overall GC Oven Temperature Stability Test Status

Pass

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Log Amp

Tested Combination1 Front SSL / External SQ
Name: 5975C inert XL with TAD

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ
Name: 5975C inert XL with TAD

Setpoint Status: **Pass**

			Drift After Five Minutes:				RFPA Voltage:	
Amu:	1050	m/z	11	mV			495	mV
Agilent Recommended:	>=	-100	and	<=	100		<=	1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ
Name: 5975C inert XL with TAD

Setpoint Status: **Pass**

Filament: 1

Setpoint Status: **Pass**

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / External SQ
Injection Tower
Name: 7693A
Source: EI - Inert

Setpoint Status: Completed
Injection Volume on Column: 1.0 uL

Overall Scouting Run Status
Completed

Signal to Noise EI

Tested Combination1 Front SSL / External SQ
Name: 5975C Inert XL with TAD

Source: EI - Inert Filament: 1
Setpoint Status: Pass
Signal to Noise: 1165
Agilent Recommended: >= 320

Source: EI - Inert Filament: 2
Setpoint Status: Pass
Signal to Noise: 2318
Agilent Recommended: >= 320

Overall Signal to Noise EI Test Status
Pass

Injection Precision

Tested Combination1 Front SSL / External SQ
Name: 7693A
Source: EI - Inert

Setpoint Status: Pass
Injection Volume on Column: 1.0 uL
Area RSD: 3.37 % Retention Time RSD: 0.02 %
Agilent Recommended: <= 5.00 <= 1.00

Overall Injection Precision Test Status
Pass

Mass Ratio Precision

Tested Combination1 Front SSL / External SQ
Injection Tower
Name: 7693A
Source: EI - Inert

Setpoint Status: Pass
Injection Volume on Column: 1.0 uL

	Area Mass 1 Abundance*s	Mass Ratio
RSD:	3.36 %	0.25 %
Agilent Recommended:	<= 5.00	<= 5.00
	Pass	Pass

Overall Mass Ratio Precision Test Status
Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

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

Tested Combination1
- Injection Technique: Injection Tower
- Inlet: Front
- Detector: External
- LTM Included?: No

Sampler 1
- Manufacturer: Agilent Technologies
- Type: Injection Tower
- Name: 7693A
- Model Number: G4513A
- Serial Number: CN12520102
- Firmware Revision: A.10.07
- Usage: Sample Injection
- Location: Front
- Syringe Volume (µL): 10

Sampler 2
- Manufacturer: Agilent Technologies
- Type: Tray
- Name: 7693A
- Model Number: G4514A
- Serial Number: CN12490026
- Firmware Revision: A.10.16
- Vial Heater: Not installed

Mainframe 1
- Manufacturer: Agilent Technologies
- Name: 7890
- Model Number: G3440A
- Serial Number: CN12521119
- Firmware Revision: A.01.14
- Oven Type: Standard

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

Detector 1
- Manufacturer: Agilent Technologies
- Name: Mass Spectrometer
- Type: Mass Spectrometer
- Location: External

Mass Spectrometer 1

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

MS EI Source 1

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

Electronic Signature

Purpose

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

Details

Full Name of Signer:	Mr.Phuwanai Yoktragul
Logged On User Name:	phuwanai.yoktragul@agilent.com
Signature Creation Date:	October 22, 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: phuwanai.yoktragul System Id: GM-3
Report Generated by Hostname: AG-TLPWX1PSE7WG Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 3:13:47 PM	Audit	SessionCreated	Session	Host Name: AG-TLPWX1PSE7WG, Drive Serial Number: 867E60CE
October 21, 2025 3:13:47 PM	start	Configuration	Session	None
October 21, 2025 3:13:47 PM	Audit	EntSement	Licensing	User is FieldEngineer and does not require an unlock code
October 21, 2025 3:24:43 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.52/Gc.02.52.xsp]. EQP File Name: [Gc.02.52.xsp]. EQP Name: [AgilentRecommended] Protocol Revision: [Gc.02.52] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.53/GcMs.02.53.xsp]. EQP File Name: [GcMs.02.53.xsp]. EQP Name: [AgilentRecommended]
October 21, 2025 3:25:01 PM	End	Configuration	Session	None
October 21, 2025 3:25:06 PM	start	Qualification	Session	OQ
October 21, 2025 3:25:06 PM	start	Execution	CDS Logon Verification - GC - Qualitative test	None
October 21, 2025 3:29:57 PM	End	Execution	CDS Logon Verification - GC - Qualitative test	Run Count: 1

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User Name: phuwanai.yoktragul System Id: GM-3
Report Generated by Hostname: AG-TLPWX1PSE7WG Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 3:30:00 PM	start	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	None
October 21, 2025 3:30:16 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints associated	Run Count: 1
October 21, 2025 3:30:42 PM	start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: +/- 1.2 psi	None
October 21, 2025 3:34:58 PM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: +/- 1.2 psi	Run Count: 1
October 21, 2025 3:37:25 PM	start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	None
October 21, 2025 3:46:14 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	Manual Data Entry
October 21, 2025 3:46:17 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature Oven - S: 230.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	Run Count: 1
October 21, 2025 3:51:07 PM	start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature Oven - S: 100.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	None
October 21, 2025 3:51:44 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature Oven - S: 100.0°C - L: +/- 1.0 AND +/- 1.0 % setpoint in K	Manual Data Entry

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Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM-3
Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 3:01:49 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature - Oven - S: 100.0°C - L: +/- -1.0 AND +/- 1.0 % setpoint in K	Run Count : 1
October 21, 2025 3:01:51 PM	start	Execution	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: +/- 0.5°C	None
October 21, 2025 4:14:28 PM	Audit	Data	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: +/- 0.5°C	Manual Data Entry
October 21, 2025 4:14:33 PM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature - Oven - S: 100.0°C - L: +/- 0.5°C	Run Count : 1
October 21, 2025 4:17:23 PM	start	Execution	Lag Amp - 5975C inert XL with TAD SQ - Source: EI - Inert	None
October 21, 2025 4:24:14 PM	End	Execution	Lag Amp - 5975C inert XL with TAD SQ - Source: EI - Inert	Run Count : 1
October 21, 2025 4:24:16 PM	start	Execution	RFPA - 5975C inert XL with TAD SQ - Source: EI - Inert	None
October 21, 2025 4:24:22 PM	End	Execution	RFPA - 5975C inert XL with TAD SQ - Source: EI - Inert	Run Count : 1
October 21, 2025 4:40:57 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ - Source - EI - Inert- Part of GCMS System Preparation	None
October 21, 2025 4:47:41 PM	start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ - Source: EI - Inert using Filament 1 - L: >= 320	None
October 21, 2025 4:47:59 PM	start	Execution	Injection Precision - Injection Tower, Front SSL, SQ - Source - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None

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Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM-3
Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 4:48:24 PM	Audit	AcqClosed	Session	None
October 22, 2025 9:27:34 AM	Audit	AcqRestarted	Session	Host Name: AG-TLFWX1PSE7WG, Drive Serial Number: 867E60CE
October 22, 2025 9:27:35 AM	Audit	SessionReloaded	Session	None
October 22, 2025 9:27:38 AM	start	Qualification	Session	OQ
October 22, 2025 9:27:39 AM	start	Execution	Injection Precision - Injection Tower, Front SSL, SQ - Source - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None
October 22, 2025 9:45:39 AM	start	Execution	Tune EI - 5975C inert XL with TAD SQ - Source - EI - Inert Filament 1 (Qualitative - No setpoints associated)	None
October 22, 2025 9:48:03 AM	End	Execution	Tune EI - 5975C inert XL with TAD SQ - Source - EI - Inert Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
October 22, 2025 9:51:19 AM	start	Execution	Tune EI - 5975C inert XL with TAD SQ - Source - EI - Inert Filament 2 (Qualitative - No setpoints associated)	None
October 22, 2025 9:51:57 AM	End	Execution	Tune EI - 5975C inert XL with TAD SQ - Source - EI - Inert Filament 2 (Qualitative - No setpoints associated)	Run Count : 1
October 22, 2025 9:52:18 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ - Source - EI - Inert- Part of GCMS System Preparation	None

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Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM-3
Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 11:20:01 AM	start	Execution	Injection Precision - Injection Tower, Front SSL, SQ - Source - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None
October 22, 2025 11:31:36 AM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD): <= 5.00%	None
October 22, 2025 11:49:18 AM	start	Execution	Injection Precision - Injection Tower, Front SSL, SQ - Source - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None
October 22, 2025 4:15:51 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ - Source - EI - Inert- Part of GCMS System Preparation	None
October 22, 2025 4:29:38 PM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ - Source - EI - Inert- Part of GCMS System Preparation	Data files Path: C:\Users\yoktragu\Downloads\DATADQ2025\DATADQ202505180-5346SC.D
October 22, 2025 4:30:31 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: 1000,Integration: Off at 0,Integration: On at 4,Integration: Off at 8]
October 22, 2025 4:30:50 PM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ - Source - EI - Inert- Part of GCMS System Preparation	Run Count : 1

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Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM-3
Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 4:33:58 PM	start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ - Source: EI - Inert using Filament 1 - L: >= 320	None
October 22, 2025 4:34:24 PM	Audit	Data	Signal to Noise EI - Injection Tower, Front SSL, SQ - Source: EI - Inert using Filament 1 - L: >= 320	Manual Data Entry
October 22, 2025 4:35:57 PM	End	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ - Source: EI - Inert using Filament 1 - L: >= 320	Run Count: 1
October 22, 2025 4:36:14 PM	start	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ - Source: EI - Inert using Filament 2 - L: >= 320	None
October 22, 2025 4:38:14 PM	Audit	Data	Signal to Noise EI - Injection Tower, Front SSL, SQ - Source: EI - Inert using Filament 2 - L: >= 320	Manual Data Entry
October 22, 2025 4:39:42 PM	End	Execution	Signal to Noise EI - Injection Tower, Front SSL, SQ - Source: EI - Inert using Filament 2 - L: >= 320	Run Count: 1
October 22, 2025 4:39:58 PM	start	Execution	Injection Precision - Injection Tower, Front SSL, SQ - Source - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	None
October 22, 2025 4:40:24 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ - Source - EI - Inert L (Area): <= 5.00% - L (Ret. Time): <= 1.00%	Data files Path: C:\Users\yoktragu\Downloads\DATADQ2025\DATADQ202505180-5372-2.D

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System Id: GM-3
Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 4:40:24 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ - Source: - EI - Inert L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-3.D
October 22, 2025 4:40:24 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ - Source: - EI - Inert L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-4.D
October 22, 2025 4:40:24 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ - Source: - EI - Inert L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-5.D
October 22, 2025 4:40:24 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ - Source: - EI - Inert L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-6.D
October 22, 2025 4:40:24 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, SQ - Source: - EI - Inert L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-7.D
October 22, 2025 4:40:48 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 50000,Integration Off at 0,Integration On at 0.2]
October 22, 2025 4:41:04 PM	End	Execution	Injection Precision - Injection Tower, Front SSL, SQ - Source: - EI - Inert L (Area) <= 5.00% - L (Ret. Time) <= 1.00%	Run Count : 1

Date: October 22, 2025 5:02:28 PM
System ID: GM-3

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Report Generated by Hostname: AG-TLFWXHPSETWG

System Id: GM-3
Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 4:41:14 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	None
October 22, 2025 4:41:27 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	None
October 22, 2025 4:41:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-2.D
October 22, 2025 4:41:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-3.D
October 22, 2025 4:41:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-4.D
October 22, 2025 4:41:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-5.D
October 22, 2025 4:41:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-6.D
October 22, 2025 4:41:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	Data files Path : C:\Users\yoktragu\Downloads \DATAOQ2025\DATAOQ202 5\PMRP5188-8372-7.D

Date: October 22, 2025 5:02:28 PM
System ID: GM-3

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User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWXHPSETWG

System Id: GM-3
Print Date: October 22, 2025 5:02:28 PM

OQHW2025_ALS-GM-3 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 4:42:18 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Inert - L (RSD) <= 5.00%	Run Count : 1
October 22, 2025 4:42:29 PM	End	Qualification	Session	OQ
October 22, 2025 4:42:29 PM	start	Reporting	Session	None
October 22, 2025 4:58:15 PM	Audit	Reporting	Session	Report Generated Certificate
October 22, 2025 4:59:51 PM	Audit	Reporting	Session	Report Generated Report
October 22, 2025 5:00:34 PM	Audit	AceClosed	Session	None
October 22, 2025 5:01:40 PM	Audit	AceRestarted	Session	Host Name AG-TLFWXHPSETWG, Drive Serial Number 867E60CE
October 22, 2025 5:01:41 PM	Audit	SessionReloaded	Session	None
October 22, 2025 5:01:43 PM	start	Qualification	Session	OQ

Date: October 22, 2025 5:02:28 PM
System ID: GM-3

RYG_FS0762

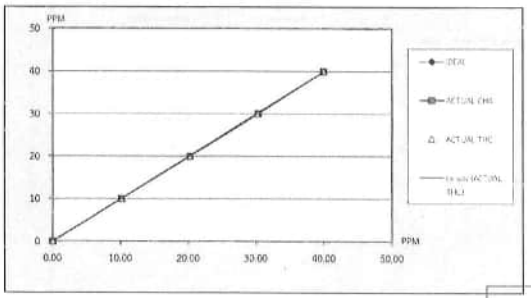
NAC

TEST REPORT

CUSTOMER NAME	: ALS Laboratory Group (Thailand) Co., Ltd. [บริษัท เอแอลเอส ลาบอราทอรี่ กรุ๊ป (ประเทศไทย) จำกัด]				
EQRIPMENT NAME	: THC Analyzer				
MANUFACTURER	: HORIBA	MODEL	: APHA-370	SERIAL NO	: U430GTHB
STANDARD GAS CONCENTRATION (PPM) (CH4) :	506.1 PPM			CYLINDER NO	: CC734373
CYLINDER PRESSURE (psig) :	1,600 PSI			CERTIFIED DATE	: 12/05/2020
CERTIFIED BY :	AIRGAS			EXPIRED DATE	: 12/05/2028

TEST RESULTS

POINT NO	TEST RESULTS						
	IDEAL	ACTUAL CH4	ERROR CH4	%ERROR CH4	ACTUAL THC	ERROR THC	%ERROR THC
ZERO	0.00	0.00	0.00	-	0.01	0.01	-
1	10.00	10.14	0.14	1.40	10.13	0.13	1.30
2	20.00	20.23	0.23	1.15	20.19	0.19	0.95
3	30.00	30.30	0.30	1.00	30.18	0.18	0.60
4	40.00	40.00	0.00	0.00	40.00	0.00	0.00
AVERAGE (%)				0.89			0.71



CALIBRATED BY ..... วัทิน บุญโสม ..... DATE : 15/1/69

CHECKED BY ..... อัมรินทร์ อัมรินทร์ ..... DATE : 15/1/69

REVIEW BY ..... APPROVED BY .....

NEXT CAL DATE : 14/01/2027

ห้องทดสอบตั้งอยู่ที่ [illegible] โทร 02-868-0812 # 15,16 , E-Mail : Engineer@Jnanalab.com
บริษัท 63/10-15,67/22-36 [illegible] โทร 02-868-0812-15 โทรสาร 02-868-1839

FO-EN-206 R01/22-10-14

NAC

CHECK LIST

CUSTOMER NAME	: ALS Laboratory Group (Thailand) Co., Ltd. [บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด]		
EQUIPMENT NAME	: THC Analyzer		
MANUFACTURER	: HORIBA	MODEL : APHA-370	SERIAL NO. : U430GTHB

TEST VALUES

NO.	THC Analyzer (APHA - 370)	UNIT	BEFORE	AFTER
1	Signal (CH4)	mV	38.60	40.40
2	Signal (THC)	mV	44.20	45.00
3	Detector	Temp °C , Standard Value : Ambient temp+(5°C to 5°C)	46.40	46.00
		Pressure kPa , Standard Value : (Ambient/1013x100 20)±4kPa	70.00	69.80
4	Ambient	kPa current atmospheric pressure	101.00	101.00
5	Purifire	°C , Standard Value : 390 °C to 420 °C	420.60	419.10
		kPa , Normal value : 8 kPa to 25 kPa	9.80	9.80
6	NMHC	°C , Standard Value : 230 °C to 260 °C	265.30	264.20
7	DC 24 V	V , Standard Value : 24 V ± 0.5 V	23.90	23.90
8	DC 5 V	V , Standard Value : 5 V ± 0.5 V	5.00	5.00
9	Bypass (Optional)	L/min, Normal value : 0.9 L/min ± 0.3 L/min		
10	Over Flow (Optional)	L/min, Standard Value : 0.8 L/min or More		
11	CH4 Sampling Reading	PPM	2.48	2.29
12	NMHC Sampling Reading	PPM	0.24	0.16
13	THC Sampling Reading	PPM	2.71	2.45
14	Zero Gas CH4/THC	PPM	0.25/0.25	0.00/0.01
15	Span Gas	PPM	39.79/39.92	40.00/40.00
G	Gas H2 ...../.....	20 PSI	20	20

Remark : Reference EX-EN-017-56 , Ambient : HC Monitor APHA-370 Operation Manual Page 831

Remark : (Ambient temperature = 5°C to 40°C)

อาการที่ตรวจพบ

- Maintenance

รายละเอียดการดำเนินการ

- ทำ Calibration Zero/Span , Multipoint

ผลการดำเนินการ

- เรียบร้อย เครื่องสามารถดำเนินการตรวจวัดได้ตามปกติ

CALIBRATED BY : วัทิต เผือง DATE : 15/1/69

CHECKED BY : ชัยนุ ฮั่วสุน DATE : 15/1/69

NAC (THAILAND) ASSOCIATES CO., LTD.

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

เลขที่ 63/14-15,67/35-36 ซอยเทพรักษ์ 7,7/1 ถนนเทพรักษ์ แขวงศีรษะจระเข้ใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02-868-1869

FO-EN-207 R00/01-08-13

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Road Bangbamru, Bangplad, Bangkok 10700 Thailand
Tel +66 2422 8331 Email : calibration@sithiporn.com

SITHIPORN associates

ilac-MRA

NSC 10/10 17025 CALIBRATION 0354

Cert. No. : ACC25042
Pages : 1 of 3

Calibration Certificate

Equipment :	SOUND CALIBRATOR
Manufacturer :	RION
Model :	NC-74
Serial No.:	34178124
ID No.:	RYG_FS0216
Condition As Found :	GOOD

REVIEW BY ..... Sipat S.

APPROVED BY .....

NEXT CAL DATE 18/ 08/ 2026

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :		
Ambient Temperature :	(23.0 ± 3)	°C
Pressure :	(101.3 ± 3)	kPa
Relative Humidity :	(50.0 ± 20)	%

Received Date :	04 AUGUST 2025
Calibration Date :	19 AUGUST 2025
Date of Issue :	20 AUGUST 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : Wichok E.
(Wichok Ekpongpradit)

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

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CALIBRATION LABORATORY

Cert. No. : ACC25042
Job No. : VC68AC0162
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by follow on IEC 60942-2003 Standard.
The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	33461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34360495	AA-3002-25	19-FEB-26
Audio Analyzer	AVR-3360A	V744B6069	EF-0013-25	13-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

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CALIBRATION LABORATORY

Cert. No. : ACC25042
Job No. : VC68AC0162
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.17	0.17	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.3	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
2.07	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

Cert. No. : ACL25316
Pages : 1 of 8

Calibration Certificate

Eqnipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472130 / 169816 / 72464
ID No.: RYG_FS0303

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 04 AUGUST 2025
Calibration Date : 18-19 AUGUST 2025
Date of Issue : 20 AUGUST 2025

REVIEW BY
APPROVED BY
NEXT CAL DATE 17/ 08/ 2026

Calibrated by : Nathakorn Pisutpaisan

Approved by :
Wichok E.
(Wichok Ekpongprndit)

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

Cert. No. : ACL25316
Job No. : VC68AC0162
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :
This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :
1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25316
Job No. : VC68AC0162
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL25316
Job No. : VC68AC0162
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise
2.1 Normal test

Measured Value (dB)
16.4

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	8.7
C - weight	15.0
Flat	20.9

3. Acoustical signal tests of frequency weightings
Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	1.4	1.4	1.5	± 1.5
1000	0.0	0.0	0.1	± 1.0
8000	-4.1	-4.0	-4.0	±5.0

Cert. No. : ACL25316
Job No. : VC68AC0162
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	± 0.3

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Job No. : VC68AC0162
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

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Job No. : VC68AC0162
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

Cert. No. : ACL25316
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10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, 3 cpeals (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a level of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

451-451/1 Srinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8338 Email : calibration@sithiphorn.com

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Cert. No. : ACL25315
Pages : 1 of 8

Calibration Certificate

Equipment :	SOUND LEVEL METER
Manufacturer :	RION
Model :	NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.:	00734218 / 146937 / 34368
ID No.:	RYG_FS0031
Condition As Found :	GOOD
Customer :	ALS LABORATORY GROUP (THAILAND) CO., LTD. 104 PHATTHANAKAN 40, PHATTHANAKAN ROAD, KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK, 10250 THAILAND.
Location :	-
Ambient Temperature :	(23.0 ± 3) °C
Pressure :	(101.3 ± 3) kPa
Relative Humidity :	(50.0 ± 20) %
Received Date :	04 AUGUST 2025
Calibration Date :	18-19 AUGUST 2025
Date of Issue :	20 AUGUST 2025

REVIEW BY
APPROVED BY
NEXT CAL DATE 17/ 08/ 2026

Calibrated by : Nathakorn Pisutpaisan

Approved by : Wichok E

(Wichok Ekpongpradit)

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Cert. No. : ACL25315
Job No. : VC68AC0162
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25315
Job No. : VC68AC0162
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL25315
Job No. : VC68AC0162
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
21.6

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	12.0
C - weight	18.0
Flat	23.7

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.8	0.8	0.8	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.1	-1.1	-1.1	±5.0

Cert. No. : ACL25315
Job No. : VC68AC0162
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.1	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	± 0.3

Cert. No. : ACL25315
Job No. : VC68AC0162
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

Cert. No. : ACL25315
Job No. : VC68AC0162
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

Cert. No. : ACL25315
Job No. : VC68AC0162
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.6	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

45/1-45/1 Sirinthorn Road, Bangbumru, Bangplad, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

SITHIPORN associates

ilac-MRA

NSC-TEST 17025 CALIBRATION 0354

Cert. No. : ACL25317
Pages : 1 of 8

Calibration Certificate

Equipment :	SOUND LEVEL METER
Manufacturer :	RION
Model :	NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.:	00472132 / 169445 / 72446
ID No.:	RYG_FS0304
Condition As Found :	GOOD
Customer :	ALS LABORATORY GROUP (THAILAND) CO., LTD. 104 PHATTHANAKAN 40, PHATTHANAKAN ROAD, KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK, 10250 THAILAND.
Location :	-
Ambient Temperature :	(23.0 ± 3) °C
Pressure :	(101.3 ± 3) kPa
Relative Humidity :	(50.0 ± 20) %
Received Date :	04 AUGUST 2025
Calibration Date :	18-19 AUGUST 2025
Date of Issue :	20 AUGUST 2025

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE 17/ 08/ 2026

Calibrated by : Nathakorn Pisutpaisan

Approved by :

Wichok B.
(Wichok Ekpongpradit)

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Cert. No. : ACL25317
Job No. : VC68AC0162
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25317
Job No. : VC68AC0162
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL25317
Job No. : VC68AC0162
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
17.9

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	8.7
C - weight	15.9
Flat	21.6

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.8	-0.7	-0.7	±5.0

Cert. No. : ACL25317
Job No. : VC68AC0162
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

Cert. No. : ACL25317
Job No. : VC68AC0162
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	49.0	0.0	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

Cert. No. : ACL25317
Job No. : VC68AC0162
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

Cert. No. : ACL25317
Job No. : VC68AC0162
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
461-461/1 Sirinthorn Road, Bangbumru, Bangplad, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

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Cert. No. : ACC25058
Pages : 1 of 3

Calibration Certificate

Equipment :	SOUND CALIBRATOR
Manufacturer :	RION
Model :	NC-74
Serial No.:	34178123
ID No.:	RYG_FS0215
Condition As Found :	GOOD
Customer :	ALS LABORATORY GROUP (THAILAND) CO., LTD. 104 PHATTHANAKAN 40, PHATTHANAKAN ROAD, KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK, 10250 THAILAND.

Location :	-	
Ambient Temperature :	(23.0 ± 3)	°C
Pressure :	(101.3 ± 3)	kPa
Relative Humidity :	(50.0 ± 20)	%

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE 07/ 10/ 2026

Received Date : 22 SEPTEMBER 2025
Calibration Date : 08 OCTOBER 2025
Date of Issue : 10 OCTOBER 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

(Nitinun Srihawan)

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Cert. No. : ACC25058
Job No. : VC68AC0188
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by follow on IEC-60942-2003 Standard.
The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	33461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26
Audio Analyzer	AVR-3360A	V744B6069	EF-0013-25	13-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   - 3.1 National Institute of Metrology (Thailand).
   - 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   - 3.3 Electrical And Electronics Institute (EEI).

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Cert. No. : ACC25058
Job No. : VC68AC0188
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.11	0.11	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.5	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.83	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a lavel of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
461-461/1 Sirinthorn Road, Bangbumru, Bangplad, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN associates

Cert. No. : ACL25352
Pages : 1 of 8

Calibration Certificate

Equipment :	SOUND LEVEL METER
Manufacturer :	RION
Model :	NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.:	01122567 / 143473 / 22605
ID No.:	RYG_FS0016
Condition As Found :	GOOD
Customer :	ALS LABORATORY GROUP (THAILAND) CO., LTD. 104 PHATTHANAKAN 40, PHATTHANAKAN ROAD, KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK, 10250 THAILAND.

Location :	-	
Ambient Temperature :	(23.0 ± 3)	°C
Pressure :	(101.3 ± 3)	kPa
Relative Humidity :	(50.0 ± 20)	%

REVIEW BY .....
APPROVED BY .....
NEXT CAL DATE 15/ 09/ 2026

Received Date : 28 AUGUST 2025
Calibration Date : 16 SEPTEMBER 2025
Date of Issue : 17 SEPTEMBER 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

(Nitinun Srihawan)

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Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120HA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL25352
Job No. : VC68AC0175
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.4

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	12.0
C - weight	18.3
Flat	24.0

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.6	0.6	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-2.3	-2.2	-2.2	±5.0

Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.1	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	± 0.3

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	132.9	-0.1	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	136.9	0.1	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2 or any value following calculation,providing a level of confidence of approximately 95 %

End of Calibration Certificate

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TEL: 10669-2116-5860-1 FAX: 10669-2116-7140

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 184 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 25-SLM-114
Request No : Req-2025-0603

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : RION
Model : NL-42
Serial Number : 01222723
ID : RYG 1 S0022
Resolution : 0.1 dB

Microphone Class : 2
Microphone Model : UC-52
Microphone S/N : 143841
Preamplifier Model : NH-24
Preamplifier S/N : 22770
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 6 March 2025
Calibrated Date : 19 March 2025
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

REVIEW BY :
APPROVED BY :
NEXT CAL DATE : 19/03/26

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	Brüel & Kjær	4192	2294985	25 June 2025	NIMT
Audio Generator	Svantek	Svan401	131	15 October 2025	WK Electric

Note

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

Calibrated By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Malhavora
Calibration Engineer Supervisor

Issue Date : 19 March 2025

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Certificate No : 25-SLM-114
Request No : Req-2025-0603

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR			
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
1000 Hz 94 dB	94.00	94.0	-0.06	94.1	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand BRON, Model NC-75, SN.35002736

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	15.1	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	12.2	0.10
C	16.6	0.10
Z	20.4	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Respone curve			UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	A	C	Z			
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
125 Hz	0.1	0.5	0.5	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.8	0.4	0.1	0.60	3.0	Pass
8000 Hz	-1.3	-1.3	-1.3	0.70	5.0	Pass1

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Certificate No : 25-SLM-114
Request No : Req-2025-0603

5. Electrical signal test of frequency weightings, Weighting network respone with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Respone curve			UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130						
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)	
63 Hz	-0.1	0.0	0.0	0.20	2.0	Pass
125 Hz	+0.1	0.0	0.0		1.5	Pass
250 Hz	0.0	0.0	0.0		1.5	Pass
500 Hz	0.0	0.1	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.0	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		3.0	Pass
8000 Hz	0.1	0.1	0.0		5.0	Pass
16000 Hz	-1.3	-1.3	0.0		+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	REF	UUC	ERR			
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
30-130 / A	REF	UUC	ERR			
UUC Time Respone	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	114.00	114.0	0.0	0.20	0.10	Pass1
Slow	114.00	114.0	0.0		0.10	Pass1
Leq	114.00	114.0	0.0		0.10	Pass1

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IM-709-SLM-01 Rev.00 Issue date 5/6/21

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TEL: 16610-2116-5860-1 FAX: 16610-2116-7140

Certificate No : 25-SLM-114
Request No : Req-2025-0603

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC			
STD Setting	(dB)	(± dB)	(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	REF	UUC	ERR			
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)	
138.00	138	137.9	-0.1	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	94.0	0.0		1.1	Pass
89.00	89	89.0	0.0		1.1	Pass
84.00	84	84.0	0.0		1.1	Pass
79.00	79	79.0	0.0		1.1	Pass
74.00	74	74.0	0.0		1.1	Pass
69.00	69	69.0	0.0		1.1	Pass
64.00	64	64.0	0.0		1.1	Pass
59.00	59	59.0	0.0		1.1	Pass
54.00	54	54.0	0.0		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.0	0.0		1.1	Pass
34.00	34	34.0	0.0		1.1	Pass
29.00	29	29.1	0.1		1.1	Pass
24.00	24	24.0	0.0		1.1	Pass

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Certificate No : 25-SLM-114
Request No : Req-2025-0603

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / A	REF	UUC	ERR			
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)	
30-130	29.50	29.7	0.2	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance Limit	Result
A / 30-130	Toneburst	Ref	UUC	ERR			
UUC Time Respone	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	200	126.0	126.1	+0.1	0.20	1.0	Pass
	2	109.0	109.0	0.0		-1.0, -2.5	Pass
	0.25	100.0	99.9	-0.1		-1.5, -5.0	Pass
Slow	200	119.6	119.6	0.0		1.0	Pass
	2	100.0	100.0	0.0		-1.0, -5.0	Pass
SEL	200	120.0	120.0	0.0		1.0	Pass
	2	100.0	100.0	0.0		-1.0, -2.5	Pass
	0.25	91.0	90.9	-0.1		-1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / C / 55-141	REF	UUC	ERR			
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Complete cycle	136.4	135.8	-0.60	0.20	3.0	Pass
Positive half cycle	135.4	135.2	-0.20		2.0	Pass
Negative half cycle	135.4	135.2	-0.20		2.0	Pass

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IM-709-SLM-01 Rev.00 Issue date 5/6/21

Certificate No : 25-SLM-114
Request No : Req-2025-0603

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC			
STD Setting	(dB)	(± dB)	(± dB)	
Positive one-half cycle	139.5			
Negative one-half cycle	139.4			
Deviated	0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC			
STD Setting	(dB)	(± dB)	(± dB)	
Initial	129.0			
Final	129.0			
Deviated	0.0	0.10	0.30	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

* Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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Certificate No : 25-SLM-114
Request No : Req-2025-0603

Decision Rule for Statements of Conformity

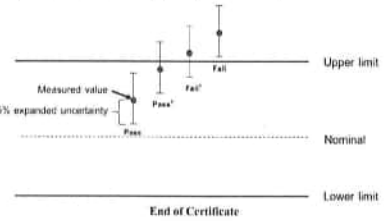
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

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

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

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



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 101 Soi Phatthanakan 50, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 25-SLM-116
Request No : Req-2025-0603

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : RION
Model : NL-42
Serial Number : 01232724
ID : RYG_180023
Resolution : 0.1 dB

Microphone Class : 2
Microphone Model : UC-52
Microphone S/N : 143486
Preamplifier Model : NH-24
Preamplifier S/N : 22620
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 6 March 2025
Calibrated Date : 19 March 2025
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

REVIEW BY :
APPROVED BY :
NEXT CAL DATE : 19/03/26

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceblity
Standard Microphone	Brüel & Kjær	4192	2294983	25 June 2025	NIMT
Audio Generator	Svantek	Svan401	131	15 October 2025	WK Electric

Note

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

Calibrated By : Mr. Noppadon Liangart, Service Calibration Engineer

Approved By : Mr. Paeit Mathavorn, Calibration Engineer Supervisor

Issue Date : 19 March 2025

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Certificate No : 25-SLM-116
Request No : Req-2025-0603

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR			
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
1000 Hz 94 dB	94.00	94.0	-0.00	94.1	-0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand RION, Model NC-75, SN 35002736

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	19.7	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	14.7	0.10
C	19.0	0.10
Z	23.4	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Respone curve			UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	A	C	Z			
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
125 Hz	0.0	0.3	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	1.0	1.0	1.0	0.60	3.0	Pass
8000 Hz	-0.4	-0.4	-0.5	0.70	5.0	Pass

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Certificate No : 25-SLM-116
Request No : Req-2025-0603

5. Electrical signal test of frequency weightings, Weighting network respone with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130						
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)	
63 Hz	-0.2	-0.1	0.0	0.20	2.0	Pass
125 Hz	-0.1	0.1	0.0		1.5	Pass
250 Hz	0.0	0.0	0.0		1.5	Pass
500 Hz	0.0	0.1	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.0	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		5.0	Pass
8000 Hz	0.1	0.1	0.0		5.0	Pass
16000 Hz	-1.3	-1.4	0.0		+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	REF	UUC	ERR			
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
30-130 / A	REF	UUC	ERR			
UUC Time Respone	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Leq	114.00	114.0	0.0		0.10	Pass

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Certificate No : 25-SLM-116
Request No : Req-2025-0603

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC			
STD Setting	(dB)	(± dB)	(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	REF	UUC	ERR			
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)	
138.00	138	138.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	94.0	0.0		1.1	Pass
89.00	89	89.0	0.0		1.1	Pass
84.00	84	84.0	0.0		1.1	Pass
79.00	79	79.0	0.0		1.1	Pass
74.00	74	74.0	0.0		1.1	Pass
69.00	69	69.0	0.0		1.1	Pass
64.00	64	64.0	0.0		1.1	Pass
59.00	59	59.0	0.0		1.1	Pass
54.00	54	54.0	0.0		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.0	0.0		1.1	Pass
34.00	34	34.0	0.0		1.1	Pass
29.00	29	29.1	0.1		1.1	Pass
24.00	24	24.3	0.3		1.1	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-709-SLM-01 Rev.01 Issue date 5/6/21

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140

Certificate No : 25-SLM-116
Request No : Req-2025-0603

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / A	REF	UUC	ERR			
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)	
30-130	29.40	29.7	0.3	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance Limit	Result
A / 30-130	Toneburst	Ref	UUC	ERR			
UUC Time Respone	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	200	126.0	126.1	+0.1	0.20	1.0	Pass
	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.9	-0.1		+1.5, -5.0	Pass
Slow	200	119.6	119.6	0.0		1.0	Pass
	2	100.0	100.0	0.0		+1.0, -5.0	Pass
SEL	200	120.0	120.0	0.0		1.0	Pass
	2	100.0	100.0	0.0		+1.0, -2.5	Pass
	0.25	91.0	90.9	-0.1		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / C / 55-141	REF	UUC	ERR			
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Complete cycle	136.4	136.4	0.00	0.20	3.0	Pass
Positive half cycle	135.4	135.2	-0.20		2.0	Pass
Negative half cycle	135.4	135.2	-0.20		2.0	Pass

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FM-709-SLM-01 Rev.01 Issue date 5/6/21

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AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140

Certificate No : 25-SLM-116
Request No : Req-2025-0603

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC			
STD Setting	(dB)	(± dB)	(± dB)	
Positive one-half cycle	139.4			
Negative one-half cycle	139.3			
Deviated	0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC			
STD Setting	(dB)	(± dB)	(± dB)	
Initial	129.0			
Final	129.0			
Deviated	0.0	0.10	0.30	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network respone with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

* Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-709-SLM-01 Rev.01 Issue date 5/6/21

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7-139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2136-3860-1 FAX: (66)0-2136-7140

Certificate No : 25-SLM-116
Request No : Req-2025-0603

Decision Rule for Statements of Conformity

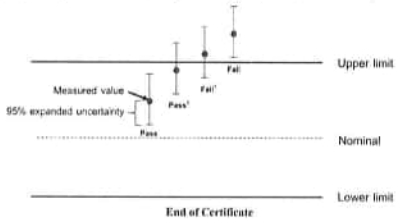
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

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

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

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



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
451-451/1 Sirinthorn Road, Bangbumru, Bangplad, Bangkok, 10700 thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

Cert. No. : ACL25314
Pages : 1 of 8

Calibration Certificate

Equipment :	SOUND LEVEL METER
Manufacturer :	RION
Model :	NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.:	00734223 / 169439 / 72460
ID No.:	RYG_FS0029
Condition As Found :	GOOD
Customer :	ALS LABORATORY GROUP (THAILAND) CO., LTD. 104 PHATTHANAKAN 40, PHATTHANAKAN ROAD, KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK, 10250 THAILAND.
Location :	-
Ambient Temperature :	(23.0 ± 3) °C
Pressure :	(101.3 ± 3) kPa
Relative Humidity :	(50.0 ± 20) %
Received Date :	04 AUGUST 2025
Calibration Date :	18-19 AUGUST 2025
Date of Issue :	20 AUGUST 2025

REVIEW BY :
APPROVED BY :
NEXT CAL DATE : 18/ 08/ 2026

Calibrated by : Nathakorn Pinutpaisan

Approved by :
Wichok Ekpongpradit

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

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Cert. No. : ACL25314
Job No. : VC68AC0162
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :
This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :
1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA20251210EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0008-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

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Cert. No. : ACL25314
Job No. : VC68AC0162
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL25314
Job No. : VC68AC0162
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.50000003

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	9.9
C - weight	16.6
Flat	22.1

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.6	0.7	0.7	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.6	-1.6	-1.6	±5.0

Cert. No. : ACL25314
Job No. : VC68AC0162
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	± 0.3

Cert. No. : ACL25314
Job No. : VC68AC0162
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

Cert. No. : ACL25314
Job No. : VC68AC0162
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

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CALIBRATION LABORATORY

Cert. No. : ACL25314
Job No. : VC68AC0162
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2 or any value following calculation,providing a level of confidence of approximately 95 %

End of Calibration Certificate

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

innovative instrument ilac-MRA ANAB ACCREDITED

Certificate of Calibration

Customer

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

Certificate No : 26-ACT-007
Request No : Req-2026-0043

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : RION
Model : NC-74
Serial Number : 34178121
ID : RYG_FS0213

Class : 1
Range : 94 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 7 January 2026
Calibration Date : 9 January 2026
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

REVIEW BY
APPROVED BY
NEXT CAL DATE 09/ 01/ 2027

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	20 June 2026
THD Multimeter	2015	1047765	NIMT	4 Febeuary 2026

Traceability : This certificate providdes traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

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

Calibrated By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 9 January 2026

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: 0660-2116-5860-1 FAX: 0660-2116-7140

Certificate No : 26-ACT-007
Request No : Req-2026-0043

Sound pressure level — **Calibration Results :** Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)
	Measured	Deviated value	Measured	Deviated value	
94 dB / 1000 Hz	94.00	0.00	-	-	0.12

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)
	Measured (Hz)	Deviated value (%)	Measured (Hz)	Deviated value (%)	
94 dB / 1000 Hz	1000.00	0.000	-	-	0.010

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)
	Measured (%)	Measured (%)	
94 dB / 1000 Hz	1.84	-	0.17

Note :

- The calibration results exclude the calibrator pressure correction.
- The calibration results exclude the microphone sensing correction.

End of Calibration

The results relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

451-451/1 Sukhonthai Road, Bangbuathong, Bangplad, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email: calibration@sithiporn.com

SITHIPORN associates

ilac-MRA

Cert. No. : ACL25352
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122567 / 143473 / 22605
ID No.: RYG_FS0016

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

REVIEW BY
APPROVED BY
NEXT CAL DATE 15/ 09/ 2026

Received Date : 28 AUGUST 2025
Calibration Date : 16 SEPTEMBER 2025
Date of Issue : 17 SEPTEMBER 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

(Nitimun Srihawan)

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

Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL25352
Job No. : VC68AC0175
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.4

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	12.0
C - weight	18.3
Flat	24.0

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.6	0.6	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-2.3	-2.2	-2.2	±5.0

Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.1	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	± 0.3

Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

Cert. No. : ACL25352
Job No. : VC68AC0175
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	132.9	-0.1	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	136.9	0.1	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a level of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
451-451/1 Sirinthorn Road, Bangbumru, Bangplad, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

Cert. No. : ACL26073
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122578 / 143842 / 74027
ID No.: RYG_FS0017

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK. 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ±3) °C
Pressure : (101.3 ±3) kPa
Relative Humidity : (50.0 ±20) %

REVIEW BY .
APPROVED BY
NEXT CAL DATE 20/01/2027

Received Date : 05 JANUARY 2026
Calibration Date : 21 - 23 JANUARY 2026
Date of Issue : 26 JANUARY 2026

Calibrated by : Nathakorn Pisutpaisan

Approved by :
(Nitinun Srihawan)

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

Cert. No. : ACL26073
Job No. : VC69AC0053
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL26073
Job No. : VC69AC0053
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL26073
Job No. : VC69AC0053
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
17.3

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	10.8
C - weight	17.0
Flat	22.7

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.4	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.6	-0.5	-0.5	±5.0

Cert. No. : ACL26073
Job No. : VC69AC0053
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.2	-0.1	±2.0
125	-0.1	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

Cert. No. : ACL26073
Job No. : VC69AC0053
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	135.9	-0.1	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.0	0.0	± 1.1

Cert. No. : ACL26073
Job No. : VC69AC0053
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

Cert. No. : ACL26073
Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a level of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
tel. +66 2433 8331 Email : calibration@sithiporn.com

Cert. No. : ACL26074
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122579 / 172172 / 74022
ID No.: RYG_FS0018

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ±3) °C
Pressure : (101.3 ±3) kPa
Relative Humidity : (50.0 ±20) %

Received Date : 05 JANUARY 2026
Calibration Date : 21 - 23 JANUARY 2026
Date of Issue : 26 JANUARY 2026

REVIEW BY
APPROVED BY
NEXT CAL DATE 20/ 01/ 2027

Calibrated by : Nathakorn Pisutpaisan

Approved by :

(Nitinun Srihawan ')

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

Cert. No. : ACL26074
Job No. : VC69AC0053
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL26074
Job No. : VC69AC0053
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL26074
Job No. : VC69AC0053
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	11.3
C - weight	18.0
Flat	23.9

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.1	± 1.5
1000	-0.1	0.0	0.0	± 1.0
8000	1.1	1.2	1.2	±5.0

Cert. No. : ACL26074
Job No. : VC69AC0053
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.6	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor k = 2 or any value following calculation,providing a level of confidence of approximately 95 %

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
459-461/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN associates

ILAC-MRA

RSC-TH-TS 17025 CALIBRATION 0194

Cert. No. : ACL26075
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122607 / 145554 / 34375
ID No.: RYG_FS0019

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 05 JANUARY 2026
Calibration Date : 21 - 23 JANUARY 2026
Date of Issue : 26 JANUARY 2026

REVIEW BY ..
APPROVED BY ..
NEXT CAL DATE.. 20/01/2027

Calibrated by : Nathakorn Piuntpaisan

Approved by :

(Nitinun Srihawan)

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

Cert. No. : ACL26075
Job No. : VC69AC0053
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	34461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	34461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 National Institute of Metrology (Thailand).
   3.2 Thailand Institute of Scientific and Technological Research (TISTR).
   3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL26075
Job No. : VC69AC0053
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Cert. No. : ACL26075
Job No. : VC69AC0053
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	+0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
18.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Weighting (dB)
A - weight	10.8
C - weight	17.4
Flat	23.1

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.7	0.7	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.3	-1.2	-1.2	+5.0

Cert. No. : ACL26075
Job No. : VC69AC0053
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	0.0	±1.5
250	-0.1	-0.1	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	+5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	136.9	-0.1	± 1.1
136.0	135.9	-0.1	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	128.9	-0.1	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation,providing a level of confidence of approximately 95 %

End of Calibration Certificate

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL.0-2717-3000-29 FAX.0-2719-9484

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NSC-TIS-TISTY025
CALIBRATION 0058

Certificate of Calibration

Cert.No.: 25CH047
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
Calibrated by :	Walalak Sirithean
Approved by :	Saithip Approved Signatory

REVIEW BY Phatchana S.
APPROVED BY
NEXT CAL DATE 18/01/27

( ) Chakrit Waewwanjua
( ) Ponpan Paipim
(✓) Saithip Meangmai

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	Coverage factor
	pH	mV	mV	pH	(±mV)	*k*
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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No. : [redacted]
Page : [redacted]

Equipment : [redacted]
Manufacturer: [redacted]
Model : [redacted]
Serial No.: [redacted]
ID No.: [redacted]
Condition As-Received: [redacted]
Received Date: [redacted]
Calibration Date: [redacted]
Reference: [redacted]
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) %

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.

Submitted by: [redacted]

Procedure used: [redacted]

Condition of this result of calibration

[redacted]

Instrument	Model	Serial No.	Certificate No.	Due Date
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Calibrated by : [redacted]
Issue Date : [redacted]

Approved Signatory : [redacted]

Result of calibration :- (*) Without adjustment ( ) After adjustment

Function: DC voltage measurement **Range:** 2000 mV

Standard Value (mV)	UUC* Reading (mV)	Error (mV)	Uncertainty (± 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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NSC TISI TIS17025 CALIBRATION 0008

Certificate of Calibration

Cert. No.: 25LM10
Page.: 1 of 2

Equipment :	DO Meter with Sensor
Manufacturer :	YSI
Model :	5000-115V
Serial No. :	15E102796
ID No. :	RYG_EN0032

REVIEW BY Photchana S.
APPROVED BY
NEXT CAL DATE 20/07/26

Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140 Thailand
Location :	TPA On Site Calibration Laboratory
Received Order :	17 January 2025
Calibrated Date :	20 January 2025
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
AC Line Voltage :	(220 ± 22) V
Calibrated by :	Warakorn Lerngagtrakul
Approved by :	Approved Signatory

( ) Chakrit Waewwanjua
(✓) Suwit Imjai
( ) Kunchit Promprat

Issue Date : 23 January 2025

The Uncertainties are for a confidence probability of approximately 95%

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Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2186080	24I1022	TPA	17 Sep 2025

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 15E100464

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor *k*
20.00	60	20.002	19.81	-0.192	0.15	2.00

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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000 FAX. 0-2719-9484

Certificate of Testing

Cert.No.: 25TW15
Page.: 1 of 2

Equipment :	DO Meter
Manufacturer :	YSI
Model :	5000-115V
Serial No. :	15E102796
ID No. :	RYG_EN0032
Received Date :	17 January 2025
Test Date :	20 January 2025
Reference :	2501-0600DSC-1
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand
Laboratory Condition :	Temperature (25 ± 5) °C Humidity (50 ± 20) %
Test Procedure :	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
Tested by :	Walalak Sirithean
Approved by :	Approved Signatory

( ) Pornthippa Tameyakul
( ) Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 21 January 2025

Condition of this result of calibration

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

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : **Dissolved Oxygen Meter Adjustment With Air 100 %**
Dissolved Oxygen Probe No.: 15E100464

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.20	0.0084

This report was certified only for the instrument we tested.It is allowable to use for study Intend to use for advertising and referral purpose is prohibited.This report may not be reproduced other in full, without written approval of the laboratory

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL.0-2717-3000-29 FAX.0-2719-9484

Certificate of Calibration

Cert. No.: 24TM1663
Page : 1 of 3

Equipment :	Low Temp. Incubator
Manufacturer :	Memmert
Model :	IPP750
Serial No. :	V818.0084
ID No. :	RYG_EN0154
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch 616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand
Location :	BOD Room
Received Order :	01 November 2024
Calibration Date :	01 November 2024
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
AC Line Voltage :	(220 ± 22) V
Calibrated by :	Krisda Malee
Approved by :	Approved Signatory

REVIEW BY Thanitak.
APPROVED BY
NEXT CAL DATE 01/05/26

( ) Ponpan Paipim
( ) Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 07 November 2024

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.

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

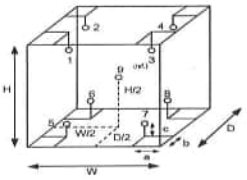
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	24LM73	TPA	18 May 2025

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	55	53
AC Supply (Volt)	220	221



Position :	Ref. Std. ID No.:
1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	23-01RTD-07
8	1RTD-2/8
9 (ref.)	23-01RTD-09

Probe Installation Details :

a =	10	cm
b =	10	cm
c =	10	cm

Dimension of Chamber :

D =	0.60	m
W =	1.0	m
H =	1.2	m
Capacity =	0.72	m³

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor *k*
20.0	20.0	20.0	0.026	0.26	0.53	2

Calibration Point	Measured Temperature (°C) Position									Uncertainty
(°C)	1	2	3	4	5	6	7	8	9 (ref.)	(±°C)
20.0	20.071	19.915	20.273	20.179	19.977	19.782	20.056	20.026	20.033	0.30

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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Certificate of Calibration

Cert. No.: 26TM461
Page : 1 of 3

Equipment :	Low Temp. Incubator
Manufacturer :	Memmert
Model :	IPP750
Serial No. :	V818.0084
ID No. :	RYG_EN0154
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch 616/10 Moo 5, T.Maenamkoo, A.Pluakdaeng, Rayong 21140, Thailand
Location :	BOD Room
Received Order :	18 March 2026
Calibration Date :	18 March 2026
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
AC Line Voltage :	(220 ± 22) V
Calibrated by :	Preecha Hlahib
Approved by :	Approved Signatory

REVIEW BY Thanitak.
APPROVED BY
NEXT CAL DATE 18/09/27

( ) Chakrit Waewwanjua
( ) Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 31 March 2026

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.

Equipment : Low Temp. Incubator
Condition As-Received : New Item
Reference : 2603-0502OC-2
Cert. No.: 26TM461

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

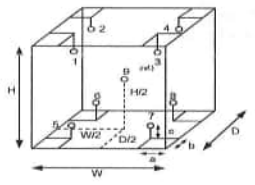
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	25LM121	TPA.	27 Jul 2026

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This measurement result is traceable to the International System of Unit maintained through :

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Environment during calibration	Beginning	Finished
Temp. (°C)	23	21
REL.Humid. (%)	37	33
AC Supply (Volt)	220	221



Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	23-16RTD-04
5	19-16RTD-05
6	19-14RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09

Probe Installation Details :

a =	10	cm
b =	10	cm
c =	10	cm

Dimension of Chamber :

D =	0.60	m
W =	1.0	m
H =	1.2	m
Capacity =	0.72	m³

Equipment : Low Temp. Incubator
Condition As-Received : New Item
Reference : 2603-0502OC-2
Cert. No.: 26TM461

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor *k*
20.0	20.0	20.0	0.019	0.19	0.34	2

Calibration Point	Measured Temperature (°C) Position									Uncertainty
(°C)	1	2	3	4	5	6	7	8	9 (ref.)	(±°C)
20.0	20.185	20.132	20.303	20.160	20.001	20.054	19.983	20.060	20.163	0.30

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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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Certificate of Calibration

Cert.No.: 25CG3668

Equipment : Burette
Capacity : 50 mL
Serial No. : -
ID. No. : RYG_EN0216
Manufacturer : Witeg
Made in : Germany

REVIEW BY Thanitak
APPROVED BY
NEXT CAL DATE 18/09/26

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5 T.MaenamKoo, A.Pluakdaeng
Rayong 21140, Thailand

Ambient Temperature : (20 ± 2.5) °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 753 mmHg
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Srisuda Khamtha

Approved by :
Approved Signatory

( ) Ponpan Paiplm
(✓) Chakrit Waewwanjua

Issue Date : 19 September 2025

The Uncertainties are for a confidence probability of approximately 95%

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

Equipment : Burette
Received Date : 16 September 2025
Condition As-Received : Used Item
Calibration Date : 18 September 2025
Reference : 2509-0504DSC-3
Cert.No.: 25CG3668

Condition of this result of calibration

1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205	B134206712	140RC007	25MM295	TPA	16 July 2026
2) Humidity/Baro/Temp	MHB-382SD	AM.42259	140EC016	25H1616	TPA	14 Aug 2026
3) Digital Thermometer	HH376	230805555	140EC013	25I1740	TPA	17 Jan 2026

This measurement result is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.
3. True value is converted to true volume at the standard temperature of 20 °C

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	*k* Factor
10	10.0264	0.0082	2.00
25	25.0141	0.0087	2.00
50	49.9952	0.010	2.00

Remark mL = cm^3 .

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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SARTORIUS

Accredited by

NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 25BKL0002

Object	Electronic non-automatic weighing instrument
Manufacturer	Sartorius
Type	MCE224S-2S00-U
Serial | QM Ident. no.	38101399 | RYG_EN0163
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
	616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.
Order no.	2230
Number of pages	4
Date of calibration	20 Feb 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.

REVIEW BY ThanitaK.

APPROVED BY

NEXT CAL DATE 20/02/26

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	Approval of the Calibration Certificate	Person in charge
06 Mar 2025	Mr. Chonchai Inthana	Kachen Lalee

Calibration object

Single range instrument

Model	MCE224S-2S00-U
Serial Number	38101399
QM Ident. no | Inventory no.	RYG_EN0163 | —
Maximum capacity (Max. load)	220.0000 g
Measured range	220.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department | Cost center	Laboratory Department, | —
Building | Floor	— | 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M23081975 ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	24.4 °C | 0.6 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 58.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g | 200 g		
	10 g	200 g
1	10.0000 g	200.0000 g
2	10.0000 g	200.0000 g
3	10.0000 g	200.0001 g
4	9.9999 g	200.0000 g
5	9.9999 g	200.0000 g
6	10.0000 g	200.0001 g
7	10.0000 g	200.0000 g
8	10.0000 g	200.0000 g
9	9.9999 g	200.0001 g
10	10.0000 g	200.0000 g
	s = 0.00005 g	s = 0.00005 g

Eccentricity

Test load (nominal):	100 g
Center	100.0000 g
Front left	100.0000 g
Back left	100.0000 g
Back right	100.0000 g
Front right	99.9999 g

Maximum deviation from centric loading indication
$|\Delta I_{ecc}|_{max}$ = 0.0001 g

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty $U(E)$	Uncertainty relative $U_{rel}(E)$
0.0100 g	0.0100 g	0.0000 g	2.00	0.00013 g	1.3 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.026 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00013 g	0.0026 %
10.0000 g	9.9999 g	-0.0001 g	2.00	0.00013 g	0.0013 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00068 %
50.0000 g	50.0001 g	0.0001 g	2.00	0.00015 g	0.00029 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00018 g	0.00018 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00026 g	0.00014 %
220.0000 g	220.0000 g	0.0000 g	2.00	0.00032 g	0.00015 %
Maximum error of indication		$\|E\|_{max}$ = 0.0001 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

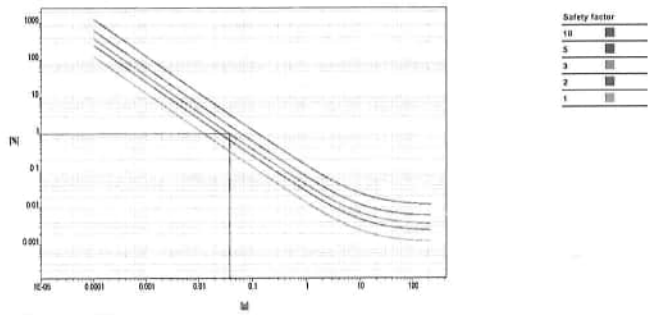
Uncertainty of measurement in use

Device adjusted before measurement	Yes
Temperature deviation considered	1.5 K (isoCAL active)
Temperature coefficient considered	1 · 10⁻⁶/K
Uncertainty of the weighing result $U_{gl}(W)$	$U_{gl}(W) = 0.00013\ g + 1.16 \cdot 10^{-6} \cdot R$

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 max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00016 g	0.0071 %
25 %	55.0000 g	0.00077 g	0.0014 %
50 %	110.0000 g	0.0014 g	0.0013 %
75 %	165.0000 g	0.0020 g	0.0012 %
100 %	220.0000 g	0.0027 g	0.0012 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0381 g

SARTORIUS

Accredited by

NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 26BCI0064

Object	Electronic non-automatic weighing instrument
Manufacturer	Sartorius
Type	MCE224S-2S00-U
Serial | QM Ident. no.	38101399 | RYG_EN0163
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
	616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand.
Order no.	278579
Number of pages	4
Date of calibration	03 Feb 2026

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.

REVIEW BY Thanitat K.

APPROVED BY D.

NEXT CAL DATE 03/02/27

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	Approval of the Calibration Certificate	Person in charge
03 Feb 2026	Mr. Chonchai Inthana	Chonchai Inthana

Calibration object

Single range instrument

Model	MCE224S-2S00-U
Serial Number	38101399
QM Ident. no | Inventory no.	RYG_EN0163 | —
Maximum capacity (Max, load)	220.0000 g
Measured up to	220.0000 g
Scale interval	0.0001 g

Place of calibration

Address	According to page 1
Department | Cost center	Laboratory Department, | —
Building | Floor	— | 1st Floor.
Room	Balance Room.
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 H/T250743 (Traceable to SI unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M25081495 ,E2(Traceable to SI unit through TCS)	19 Aug 2027

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	03 Feb 2026
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	25 °C | 0.5 K
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 49.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g | 200 g		
	10 g	200 g
1	10.0000 g	200.0000 g
2	10.0000 g	199.9999 g
3	10.0000 g	200.0000 g
4	10.0000 g	200.0001 g
5	9.9999 g	199.9999 g
6	10.0000 g	200.0000 g
7	10.0000 g	199.9999 g
8	10.0000 g	200.0000 g
9	9.9999 g	200.0001 g
10	10.0000 g	200.0000 g
	s = 0.00004 g	s = 0.00007 g

Eccentricity

Test load (nominal):	100 g
Center	100.0001 g
Front left	100.0002 g
Back left	100.0002 g
Back right	100.0000 g
Front right	100.0000 g
Maximum deviation from centric loading indication $\lvert\Delta I_{ecc}\rvert_{max}$ = 0.0001 g	

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty U(E)	Uncertainty relative $U_{rel}(E)$
0.0100 g	0.0100 g	0.0000 g	2.00	0.00012 g	1.2 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00017 g	0.17 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00017 g	0.034 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00017 g	0.017 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00017 g	0.0034 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00017 g	0.0017 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00018 g	0.00088 %
50.0000 g	50.0000 g	0.0000 g	2.00	0.00016 g	0.00037 %
100.0000 g	100.0001 g	0.0001 g	2.00	0.00021 g	0.00021 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00030 g	0.00015 %
220.0000 g	220.0001 g	0.0001 g	2.00	0.00034 g	0.00015 %
Maximum error of indication		$\lvert E\rvert_{max}$ = 0.0001 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

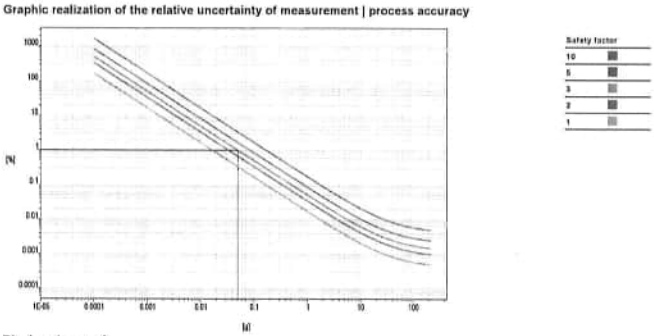
Uncertainty of measurement in use

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 $U_{gl}(W)$	**$U_{gl}(W) = 0.00017\ g + 4.25 \cdot 10^{-6} \cdot R$**

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 max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00018 g	0.0082 %
25 %	55.0000 g	0.00040 g	0.00073 %
50 %	110.0000 g	0.00064 g	0.00058 %
75 %	165.0000 g	0.00087 g	0.00053 %
100 %	220.0000 g	0.0011 g	0.00050 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0507 g

SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate of Calibration

Equipment	:	**Chamber (Oven)**
Manufacturer	:	**MEMMERT**
Model	:	**UF 110**
Serial No.	:	**B416.2420**
Customer Code	:	**RYG_EN0012**
ID No.	:	**T6444A5**
Customer	:	**ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)**
		616/10 Moo 5 T.Maenamkoo,
		A.Pluakdaeng, Rayong 21140
Customer Location	:	**ENVIRONMENT LABORATORY**
Date of Receipt	:	**3 September 2025**
Calibrated By	:	**Sujjar Naknakred (Site Calibration Manager)**
Approved By	:	**Boonchai Suriyawong (Site Calibration Manager)**
Date of Issue	:	17 SEP 2025

REVIEW BY Thanitch.
APPROVED BY D.
NEXT CAL. DATE 10/09/67

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

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Calibration Report

Equipment	:	**Chamber (Oven)**
Date of Calibration	:	**10 September 2025**
Environment	:	**Temperature : 35.7-36.6 °C**
		Line Voltage : 226.8-233.7 V
		Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2019) and AS2853-1986).
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

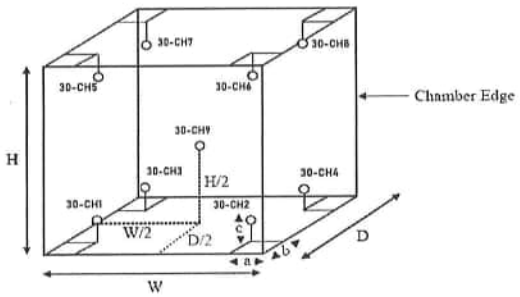
Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	30-(CH1-10)	T242203	9 November 2025
DATA LOGGER	34970A	T47	T242203	9 November 2025

3. This certificate is traceable to :
   National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 3 Hour 29 Minute At 104 °C
   Fresh Air Damper [X] Open [X] Min [ ] Medium [ ] Max
   [ ] Close
   [ ] Not Available
5. Adjustment :
   ( ) without adjustment (X) after adjustment

Approved By

SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Calibration Report



Remark : Internal Dimensions of Chamber : W (Width) = 56 cm. , H (Height) = 46 cm. and D (Depth) = 40 cm.
Size of Installed Standard sensor number 30-CH1 to number 30-CH8 : a = 5 cm .b = 5 cm. and c = 5 cm.
Size of Installed Standard sensor number 30-CH9 : W/2 = 56 cm./2 , H/2 = 46 cm./2 and D/2 = 40cm./2

Measurement Results

	Average Standard Reading at each position (°C)								
Calibration Point	30-CH1	30-CH2	30-CH3	30-CH4	30-CH5	30-CH6	30-CH7	30-CH8	30-CH9
104	104.02	103.70	104.01	104.16	104.11	104.08	104.01	104.33	103.61
180	180.67	178.78	180.38	179.85	179.16	180.27	180.98	181.04	179.49

Chamber (Oven)			Temperature Distribution				
Setting °C	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
104.0	103.9 , 104.1	104.0	104.08	0.08	0.61	0.42	2.00
180.0	179.9 , 180.1	180.0	180.07	0.21	1.51	0.52	2.00

* The quoted uncertainty exclude "uniformity"
The calibration result apply only the above calibrated item.
The result of test was found accurate as shown on date and place of test only.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate.

Approved By.

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Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate of Calibration

Equipment	:	**DIGESTION UNIT**
Manufacturer	:	**Gerhardt, Germany**
Model	:	**KT - 20S**
Serial No.	:	**572021009**
Customer Code	:	**RYG_EN0188**
ID No.	:	**T6452A5**
Customer	:	**ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)**
		616/10 Moo 5 T.Maenamkoo,
		A.Pluakdaeng, Rayong 21140
Customer Location	:	**ENVIRONMENT LABORATORY**
Date of Receipt	:	**3 September 2025**
Calibrated By	:	**Sujjar Naknakred (Site Calibration Manager)**
Approved By	:	**/ Boonchai Suriyawong (Site Calibration Manager)**
Date of Issue	:	17 SEP 2025

REVIEW BY Thanitch.
APPROVED BY D.
NEXT CAL. DATE 10/09/67

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

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Calibration Report

Equipment : DIGESTION UNIT
Date of Calibration : 10 September 2025
Environment : Temperature : 21.7 - 24.3 °C
Line Voltage : 226.9 - 232.1 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

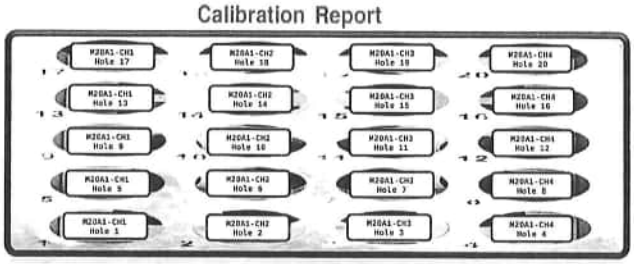
1. This equipment was calibrated by insert four standard thermocouples type S into its chamber , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T10.
2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	Type S	M20A1-(CH1-CH4)	T250750	14 May 2026
DATA LOGGER	34970A	T261	T250750	14 May 2026

3. This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
Equipment Description :
Time Constant 1 Hour 46 Minute At 380 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
5. Adjustment :
(X) without adjustment ( ) after adjustment

Approved By. _____

Calibration Report



DISPLAY CONTROL (FRONT)

Measurement Results

Cal.Point	Setting	Reading	STD.	Position of Standards at Block									
(°C)	(°C)	(°C)	Reading	M20A1-CH1 Hole 1	M20A1-CH2 Hole 2	M20A1-CH3 Hole 3	M20A1-CH4 Hole 4	M20A1-CH1 Hole 5	M20A1-CH2 Hole 6	M20A1-CH3 Hole 7	M20A1-CH4 Hole 8	M20A1-CH1 Hole 9	M20A1-CH2 Hole 10
380	380	380	Max °C	381.2	380.5	381.0	381.0	379.2	380.6	381.3	377.7	382.0	381.5
			Min °C	380.7	380.0	380.4	380.5	378.6	380.1	380.9	377.2	381.9	380.9
			Average °C	381.0	380.3	380.7	380.8	378.9	380.4	381.1	377.5	382.4	381.2
			Stability ±°C	0.3	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.5	0.3

Cal.Point	Setting	Reading	STD.	Position of Standards at Block									
(°C)	(°C)	(°C)	Reading	M20A1-CH3 Hole 11	M20A1-CH4 Hole 12	M20A1-CH1 Hole 13	M20A1-CH2 Hole 14	M20A1-CH3 Hole 15	M20A1-CH4 Hole 16	M20A1-CH1 Hole 17	M20A1-CH2 Hole 18	M20A1-CH3 Hole 19	M20A1-CH4 Hole 20
380	380	380	Max °C	382.5	377.2	378.7	378.8	378.5	379.9	383.3	381.0	382.4	381.1
			Min °C	381.7	376.5	378.5	378.5	378.1	379.5	382.7	380.6	381.6	380.4
			Average °C	382.1	376.8	378.6	378.7	378.3	379.7	383.0	380.8	382.0	380.8
			Stability ±°C	0.4	0.4	0.1	0.2	0.2	0.2	0.3	0.2	0.4	0.4

The expanded uncertainty of temperature measurement was ± 1.8 °C
The calibration result apply only the above calibrated item.
The result of test was found accurate as shown on date and place of test only.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 , provising a level of confidence of approximately 95 %.

End of Certificate.

Approved By. _____

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Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate of Calibration

Equipment : Liquid Bath (Water)
Manufacturer : Memmert
Model : WNE29
Serial No. : L623.0105
Customer Code : RYG_EN0220
ID No. : T5650A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenamkoo,
A.Pluakdaeng, Rayong 21140
Customer Location : Wet Chemistry Lab
Date of Receipt : 19 November 2025
Calibrated By : Sujjar Naknakred (Site Calibration Manager)
Approved By : _____ / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 01 DEC 2025

RECEIVED Thanitath
CALIBRATED BY _____
CALIBRATION DATE 27/11/25

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

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Calibration Report

Equipment : Liquid Bath (Water)
Date of Calibration : 27 November 2025
Environment : Temperature : 25.5-25.7 °C
Line Voltage : 221.8-225.5 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 (based on ASTM E715-80 (Reapproved 2022)).
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M18 (CH1-CH5)	T251758	17 October 2026
DATA LOGGER	34970A	T261	T251758	17 October 2026

3. This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
Equipment Description :
Time Constant 1 Hour 3 Minute At 63 °C
5. Adjustment :
(X) without adjustment ( ) after adjustment

Approved By. _____

SCG

Metrology Center

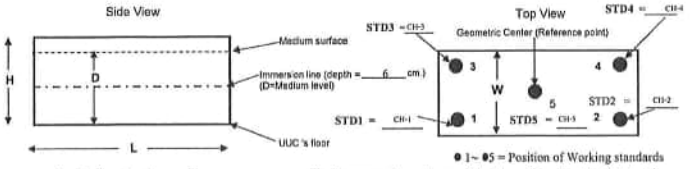
SCI ECO Services Company Limited

51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

NSC-TISI-TIS 17025 CALIBRATION 0244

Certificate No. T252169

Calibration Report



● 1~ ●5 = Position of Working standards

- D = Medium level : 12 cm. Working space dimension : 59 × 35 × 14 (WxLxH)
- UUC 's medium : Water
- Working standards are located at 2.5 cm. away from each coner and walls.

Measurement Results:

	Average Standard Reading at each position (°C)				
Calibration Point	**CH-1**	**CH-2**	**CH-3**	**CH-4**	**CH-5**
63	62.93	63.13	62.94	63.10	63.09
85	85.15	85.33	85.21	85.43	85.20

Liquid Bath (Water)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average	Stability	Uniformity	Uncertainty	Coverage
	Min , Max	Average	(°C)	(±°C)	(±°C)	(±°C)	Factor *k*
63.0	62.9 , 63.1	63.0	63.04	0.08	0.17	0.27	2.06
85.0	84.8 , 85.2	85.0	85.26	0.13	0.24	0.43	2.23

*** The quoted uncertainty exclude "uniformity"**

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate.

Approved By.

FM-TL07 102/27-03-68

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-TIS 17025 CALIBRATION 0085

Certificate of Calibration

Cert.No.: 25CH1370

REVIEW BY Pitthaya T.

APPROVED BY Sgt S

NEXT CAL DATE 26/11/26

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	Seven2Go S2
Serial No. :	C232588422
ID No. :	RYG_FS0607
Condition As-Received:	Used Item
Received Date :	25 November 2025
Calibration Date :	26 November 2025
Reference :	2511-0724DSC-3
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch 616/10 Moo 5, T.Maenam Koo, 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
Calibrated by :	Walalak Sirithean
Approved by :	Approved Signatory

( ) Chakrit Waewwanjua
( ) Ponpan Palpim
(✓) Saithip Meangmai

Issue Date : 28 November 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	25E2743	25 Aug 2026
2) Ref. Standard Thermometer	4982054	110RC044	251708	03 July 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	1114384	12 June 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1135355	16 Aug 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	Coverage factor
	pH	mV	mV	pH	(±mV)	*k*
pH Meter	4.00	177.48	178	4.00	0.58	2.00
S/N.: C232588422	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.00	0.58	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	4.01	180	0.0086	2.05
S/N.: 5232481	6.965	6.97	5	0.011	2.00
	10.010	10.01	-171	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab Expert Go-ISM
- Serial No. : 5232481

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
45.0	45.001	45.0	-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-

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Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th
NSC-TISI-TIS 17025 CALIBRATION 0244

Certificate of Calibration

Equipment	:	**Chamber (Cold Room)**
Manufacturer	:	**MODULAR**
Model	:	**IREVCOHCOO**
Serial No.	:	**C00351459**
Customer Code	:	**RYG_EN0184**
ID No.	:	**T1939A5**
Customer	:	**ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)**
		616/10 Moo 5 T.Maenamkoo,
		A.Pluakdaeng, Rayong 21140
Customer Location	:	**ENVIRONMENT LABORATORY**
Date of Receipt	:	**19 November 2025**
Calibrated By	:	**Sujjar Naknakred (Site Calibration Manager)**
Approved By	:	**/ Boonchai Suriyawong (Site Calibration Manager)**
Date of Issue	:	01 DEC 2025

REVIEW BY Thanitall
APPROVED BY
DATE 29/05/67

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

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NSC-TISI-TIS 17025 CALIBRATION 0244

Calibration Report

Equipment	:	**Chamber (Cold Room)**
Date of Calibration	:	**27 November 2025**
Environment	:	**Temperature : 24.7-25.6 °C**
		Line Voltage : 222.3-226.3 V
		Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2019) and AS2853-1986).
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

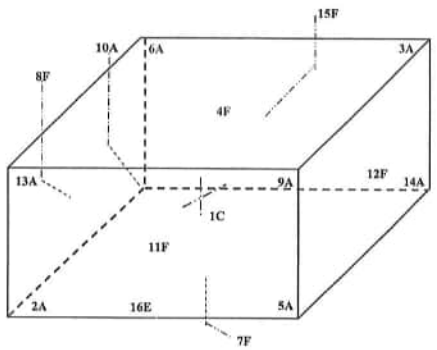
Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T251760	17 October 2026
TC	TYPE T	TN171-TN180	T251760	17 October 2026
DATA LOGGER	34970A	T261	T251760	17 October 2026

3. This certificate is traceable to :
   National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 1 Hour 12 Minute At 3 °C
   Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
   ☐ Close
   ☒ Not Available
5. Adjustment :
   ( ) without adjustment (X) after adjustment

Approved By.

SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
NSC-TISI-TIS 17025 CALIBRATION 0244

Calibration Report



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C	=	TN161	11F	=	TN171
2A	=	TN162	12F	=	TN172
3A	=	TN163	13A	=	TN173
4F	=	TN164	14A	=	TN174
5A	=	TN165	15F	=	TN175
6A	=	TN166	16E	=	TN176
7F	=	TN167			
8F	=	TN168			
9A	=	TN169			
10A	=	TN170			

Approved By.

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Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
NSC-TISI-TIS 17025 CALIBRATION 0244

Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)									
	1C TN161	2A TN162	3A TN163	4F TN164	5A TN165	6A TN166	7F TN167	8F TN168	9A TN169	10A TN170
3	2.59	2.80	2.94	2.86	3.05	3.44	3.11	3.30	3.29	3.66
	11F TN171	12F TN172	13A TN173	14A TN174	15F TN175	16E TN176				
	3.41	3.56	3.38	3.54	3.36	3.16				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability(±°C)	Uniformity(°C)	Uncertainty(±°C)	Coverage Factor *k*
	Min , Max	Average					
3.0	2.9 , 4.1	3.7	3.21	1.25	1.92	1.85	2.00

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate.

Approved By.

DKSH

Certificate of Calibration

Equipment:	CONDUCTIVITY METER	Certificate No.:	C24250274
Manufacturer:	Thermo Scientific	Job No.:	WO-00096654
Model:	Orion STAR A215	Issued Date:	3 December 2025
Serial No.:	X58821	Page:	1 of 2
ID No.:	RYG-EN0200		
Condition of the item:	Normal		

Customer: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenamkoo,
A.Pluakdaeng, Rayong 21140, Thailand.

REVIEW BY Photchanas
APPROVED BY
NEXT CAL. DATE 1/12/26

Environment Condition: Temperature 21.8 °C ± 0.5 °C
Relative Humidity 50.5 % ± 1.8 %

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
(Wet Chemistry) 616/10 Moo 5 T.Maenamkoo,
A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr.Nattapat Rungrueang
Calibration Date: 1 December 2025
The Method Used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14
Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 1100180, 1135990, 1100182, 1066609

(Mr. Nattapat Rungrueang)
Person in charge

(Mr. Udon Srichana)
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.

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DKSH Technology Limited
2533 กรุงเทพมหานคร ประเทศไทย 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:

Manufacturer: Thermo Scientific **Model :** ORION 013005MD **Electrode Serial No.:** YQ1-11982

Before Adjustment

Standard Conductivity Solution		Unit Under Calibration Reading		Correction		Coverage Factor (k)	Uncertainty (±)	
25.000	µS/cm	27.29	µS/cm	-2.290	µS/cm	2.00	0.28	µS/cm
84.047	µS/cm	88.25	µS/cm	-4.203	µS/cm	2.00	0.68	µS/cm
1413.5	µS/cm	1444	µS/cm	-30.5	µS/cm	2.00	11	µS/cm
12.881	mS/cm	13.26	mS/cm	-0.379	mS/cm	2.00	0.098	mS/cm

After Adjustment ; at 25.000 µS/cm, 84.047 µS/cm, 1413.5 µS/cm, 12.881 mS/cm

Standard Conductivity Solution		Unit Under Calibration Reading		Correction		Coverage Factor (k)	Uncertainty (±)	
25.000	µS/cm	25.03	µS/cm	-0.030	µS/cm	2.00	0.28	µS/cm
84.047	µS/cm	84.06	µS/cm	-0.013	µS/cm	2.00	0.68	µS/cm
1413.5	µS/cm	1413	µS/cm	0.5	µS/cm	2.00	11	µS/cm
12.881	mS/cm	12.89	mS/cm	-0.009	mS/cm	2.00	0.098	mS/cm

The End of Certificate

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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

DKSH

Checklist for Conductivity Meter

Worksheet number: WO-00096654

Instrument type: Conductivity Meter Model: Orion STAR A215 S/N: X58821

Check (receive) 01 Dec 2025		Checklist	Check (send) 01 Dec 2025		Note
Normal	Defective		Normal	Defective	
☑	☐	1. Integrity of the tools	☑	☐	
☑	☐	2. Cleanliness of tools	☑	☐	
☑	☐	3. On-Off Switch	☑	☐	
☑	☐	4. Keypad	☑	☐	
☑	☐	5. Display, Screen Contrast	☑	☐	
☑	☐	6. Electrode and Connection Cable	☑	☐	
☐	☐	7. Electrode (Dust Protection Hood)	☐	☐	-
☑	☐	8. Stand	☑	☐	

Recommend :

Mr.Nattapat Rungrueang
Service Engineer

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

DKSH

Certificate of Calibration

Equipment :	Digital Thermometer with Probe	Certificate No. :	C15251274
Manufacturer:	Thermo Scientific	Job No. :	WO-00096654
Model:	Orion STAR A215	Issued Date :	04 December 2025
Serial No.:	X58821	Page:	1 of 2
ID No.:	RYG-EN0200		
Condition of the item:	Normal		

Customer : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenamkoo,
A.Pluakdaeng, Rayong 21140, Thailand.

REVIEW BY Photchanas
APPROVED BY
NEXT CAL. DATE 1/12/26

Environment Condition : Temperature: 30 °C ± 10 °C
Relative Humidity: 55 % ± 25 %
Voltage: 220 VAC ± 10 %

Calibration Place : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
(Wet Chemistry) 616/10 Moo 5 T.Maenamkoo,
A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By : Mr. Nattapat Rungrueang
Calibration Date : 01 December 2025
The Method Used : In house method, CAL-WI-69, by comparison with standard thermometer
Traceability : This certificate is traceable to the International System of Unit maintained by: Quality Reborn Co.,Ltd. (QR)

(Mr. Nattapat Rungrueang)
Person in charge

(Mr. Tweewong Thaithlang)
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.

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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

DKSH

Certificate No.: C15251274

Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR25-2474	11 August 2025	11 August 2026

Calibration Results:

Without Adjustment

Sensor Type: RTD Electrode Serial No. YQ1-11982 Channel: -

Diameter (mm): 15 Length (mm): 120 Immersion (mm): 110

Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.960	24.9	0.060	0.20

The End of Certificate

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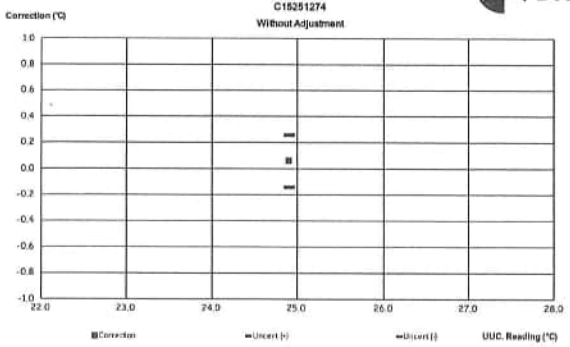
2533 Sukhumvit Road, Bangchak, Prakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

DKSH



DKSH

ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ
(Digital Thermometer Checklist)

Equipment : Digital Thermometer with Probe Certificate No. : C15251274

Serial No. : X58821 Model : Orion STAR A215

Check Date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
1-Dec-2025			1-Dec-2025		
Normal	Defective		Normal	Defective	
		General			
☑	☐	1. สายไฟ (Electric wire)	☑	☐	
☑	☐	2. Adaptor / Power supply 220 / 110 VAC	☑	☐	
☑	☐	3. การทำงาน (On/Off Switch)	☑	☐	
☑	☐	4. การทำงาน (Selector Key)	☑	☐	
☑	☐	5. หน้าจอแสดงผล (Display)	☑	☐	
☐	☐	6. แบตเตอรี่ (Battery)	☐	☐	ไม่มี
☑	☐	7. สภาพตัวเครื่อง (Equipment Body)	☑	☐	
☑	☐	8. หัววัดเซ็นเซอร์ (Sensor (In / Ex)	☑	☐	

Note : _____

_____

_____

Mr. Nattapat Rungnueang

Service Engineer

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
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SCG

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Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

NSC-TBI-TS 17025 CALIBRATION 0244

Certificate No. T252169

Certificate of Calibration

Equipment	:	**Liquid Bath (Water)**
Manufacturer	:	**Memmert**
Model	:	**WNE29**
Serial No.	:	**L623.0105**
Customer Code	:	**RYG_EN0220**
ID No.	:	**T5650A5**
Customer	:	**ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)**
		616/10 Moo 5 T.Maenamkoo,
		A.Pluakdaeng, Rayong 21140
Customer Location	:	**Wet Chemistry Lab**
Date of Receipt	:	**19 November 2025**
Calibrated By	:	**Sujjar Naknakred (Site Calibration Manager)**
Approved By	:	**/ Boonchai Suriyawong (Site Calibration Manager)**
Date of Issue	:	01 DEC 2025

Thanitall 27/11/25

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

Certificate No. T252169

Calibration Report

Equipment : **Liquid Bath (Water)**
Date of Calibration : **27 November 2025**
Environment : **Temperature : 25.5-25.7 °C**
Line Voltage : 221.8-225.5 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 (based on ASTM E715-80 (Reapproved 2022)).
   All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

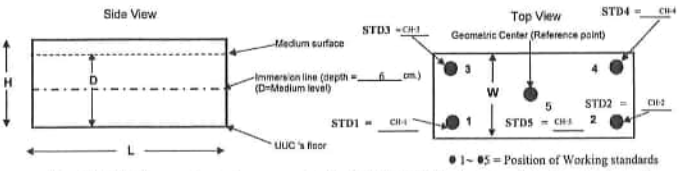
Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M18 (CH1-CH5)	T251758	17 October 2026
DATA LOGGER	34970A	T261	T251758	17 October 2026

3. This certificate is traceable to :
   National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant 1 Hour 3 Minute At 63 °C
5. Adjustment :
   (X) without adjustment ( ) after adjustment

Approved By.

Certificate No. T252169

Calibration Report



● 1~ ●5 = Position of Working standards

- D = Medium level : 12 cm. Working space dimension : 59 X 35 X 14 (WxLxH)
- UUC 's medium : Water
- Working standards are located at 2.5 cm. away from each coner and walls.

Measurement Results:

	Average Standard Reading at each position (°C)				
Calibration Point	**CH-1**	**CH-2**	**CH-3**	**CH-4**	**CH-5**
63	62.93	63.13	62.94	63.10	63.09
85	85.15	85.33	85.21	85.43	85.20

Liquid Bath (Water)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average	Stability	Uniformity	Uncertainty	Coverage
	Min , Max	Average	(°C)	(±°C)	(±°C)	(±°C)	Factor *k*
63.0	62.9 , 63.1	63.0	63.04	0.08	0.17	0.27	2.06
85.0	84.8 , 85.2	85.0	85.26	0.13	0.24	0.43	2.23

*** The quoted uncertainty exclude "uniformity"**
The calibration result apply only the above calibrated item.
The result of test was found accurate as shown on date and place of test only.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate.

Approved By.

RYG_EN0224

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Certificate of System Qualification

ES-IQ

System ID: MY25330CQ06
Organization Name: ALS Laboratory Group (Thailand) Co.Ltd.
Organization Location: 616/10 Moo 5, T. Mae Nam Khu, A. Phak Daeng, Rayong, 21140

Date: August 22, 2025 3:25:12 PM
EQP Name: AgilentRecommended

EQP Revision: ES.02.50
Overall Qualification Status: Pass

REVIEW BY Thanisalu
APPROVED BY
NEXT CAL DATE 15 Aug 2026

Purchase Order Details
Overall Test Status **Completed**

Preparation and Installation Details
Overall Test Status **Completed**

Documentation
Overall Test Status **Completed**

Product Quality Assurance Details
Overall Test Status **Completed**

Startup
Overall Test Status **Pass**

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Instrument Details

Purpose
This section describes the as found system configuration.

Details

Spectrometer 1	
Manufacturer	Agilent Technologies
Name	5800 VDV
Model Number	G8018A
Sample Introduction	Double pass glass cyclonic spraychamber and seaspray nebulizer
Serial Number	MY25330CQ06
Firmware Revision	6509
Chiller 1	
Manufacturer	Agilent Technologies
Name	Other Unspecified
Other Unspecified Name	Recirculating Chiller
Model Number	Other Unspecified
Other Unspecified Model Number	G8498A
Serial Number	2506-00251
Autosampler 1	
Manufacturer	Agilent Technologies
Name	SPS4
Model Number	G8410A
Serial Number	AU252321415
Switching Valve Accessory 1	
Manufacturer	Agilent Technologies
Name	AVS 7
Model Number	G8495
Serial Number	MY25330MR06

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Details

Full Name of Signer:	Panthep Kurasathain
Logged On User Name:	panthep_kurasathain@agilent.com
Signature Creation Date:	August 22, 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: panthep_kurasathain — System Id: MY2530CQ06
Report Generated by Hostname: AG-5CG31164RX — Print Date: August 22, 2025 3:25:14 PM

IQHW ALS 5800 22Aug25 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
August 20, 2025 3:05:31 PM	Audit	SessionCreated	Session	Host Name: AG-5CG31164RX, Drive Serial Number: E0F6A480
August 20, 2025 3:05:31 PM	start	Configuration	Session	None
August 20, 2025 3:05:31 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
August 22, 2025 3:12:43 PM	Audit	Exploaded	Session	EQP details for primary technique [Ex] - File path: [ProtocolRoots\Ex\Configurations\02.50\Ex.02.50.eqp] EQP File Name: [Ex.02.50.eqp], EQP Name: [AgilentRecommended], Protocol Revision: [Ex.02.50]
August 22, 2025 3:12:43 PM	End	Configuration	Session	None
August 22, 2025 3:12:54 PM	start	Qualification	Session	IQ
August 22, 2025 3:12:55 PM	start	Execution	Purchase Order Details : Purchase Order	None
August 22, 2025 3:13:54 PM	start	Execution	Preparation and Installation Details : Preparation	None
August 22, 2025 3:13:55 PM	End	Execution	Purchase Order Details : Purchase Order	Run Count : 1
August 22, 2025 3:14:22 PM	start	Execution	Documentation : Documentation	None
August 22, 2025 3:14:23 PM	End	Execution	Preparation and Installation Details : Preparation	Run Count : 1

Page 1 / 2

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User Name: panthep_kurasathain — System Id: MY2530CQ06
Report Generated by Hostname: AG-5CG31164RX — Print Date: August 22, 2025 3:25:14 PM

IQHW ALS 5800 22Aug25 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
August 22, 2025 3:14:44 PM	start	Execution	Product Quality Assurance : Quality Assurance	None
August 22, 2025 3:14:44 PM	End	Execution	Documentation : Documentation	Run Count : 1
August 22, 2025 3:14:56 PM	start	Execution	Startup : Startup	None
August 22, 2025 3:14:57 PM	End	Execution	Product Quality Assurance : Quality Assurance	Run Count : 1
August 22, 2025 3:15:04 PM	End	Execution	Startup : Startup	Run Count : 1
August 22, 2025 3:15:10 PM	End	Qualification	Session	IQ
August 22, 2025 3:15:10 PM	start	Reporting	Session	None
August 22, 2025 3:23:41 PM	Audit	Reporting	Session	Report Generated : Certificate
August 22, 2025 3:24:16 PM	Audit	Reporting	Session	Report Generated : Report

Page 2 / 3

SCG

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SCI ECO Services Company Limited
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Saraburi Tel : +669 8247 2360
Website : www.scleco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T251980

Certificate of Calibration

Equipment	:	**Hot Block**
Manufacturer	:	**environmental express**
Model	:	**SC196**
Serial No.	:	**2025CECW6557**
Customer Code	:	**RYG_EN0227**
ID No.	:	**T6795A5**
Customer	:	**ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)**
		616/10 Moo 5, T.Maenamkoo, A.Pluakdaeng,
		Rayong 21140
Customer Location	:	**Laboratory**
Date of Receipt	:	**29 October 2025**
Calibrated By	:	**Boonchai Suriyawong (Site Calibration Manager)**
Approved By	:	**/ Sujjar Naknakred (Site Calibration Manager)**
Date of Issue	:	14 NOV 2025

Thank U.
04/11/25

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

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Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980

Calibration Report

Equipment : **Hot Block**
Date of Calibration : **4-5 November 2025**
Environment : **Temperature : 24.4-25.9 °C**
Line Voltage : 221.4-225.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 20 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20. All data show below were final values and the initial data from customer request .
   The temperature scale used was based on ITS - 90 .
2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN91-TN100	T242036	3 December 2025
TC	TYPE T	TN101-TN110	T242036	3 December 2025
DATA LOGGER	34970A	T121	T242036	3 December 2025

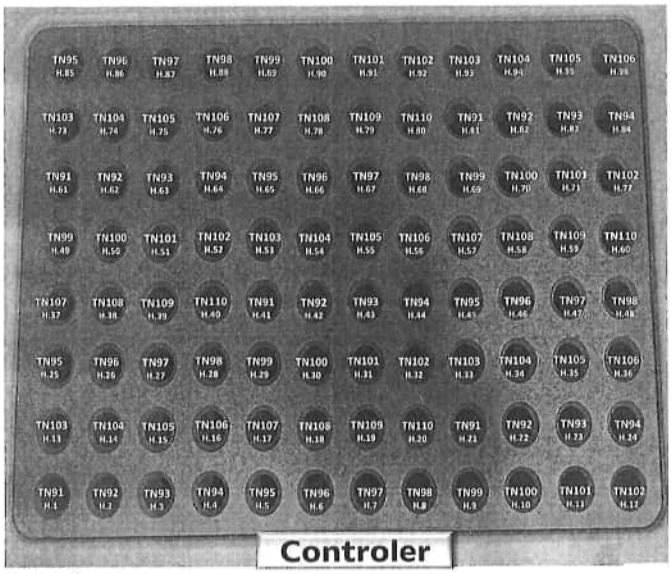
3. This certificate is traceable to :
   National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)
4. Condition of calibrated item : good
   Equipment Description :
   Time Constant - Hour 40 Minute At 95 °C
   Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
   ☐ Close
   ☒ Not Available
5. Adjustment :
   (X) without adjustment ( ) after adjustment

Approved By._____

SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980

Calibration Report



** H = Hole

Approved By._____

FM-TL05 I02/27-03-68

SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
95	TN91 H.1	TN92 H.2	TN93 H.3	TN94 H.4	TN95 H.5	TN96 H.6	TN97 H.7	TN98 H.8	TN99 H.9	TN100 H.10
	95.48	95.56	95.43	95.48	95.33	95.15	95.70	95.28	95.31	95.21
	TN101 H.11	TN102 H.12	TN103 H.13	TN104 H.14	TN105 H.15	TN106 H.16	TN107 H.17	TN108 H.18	TN109 H.19	TN110 H.20
	95.36	95.58	95.24	94.92	95.08	94.77	94.93	95.63	95.54	95.75
	TN91 H.21	TN92 H.22	TN93 H.23	TN94 H.24	TN95 H.25	TN96 H.26	TN97 H.27	TN98 H.28	TN99 H.29	TN100 H.30
	95.12	95.85	95.18	95.58	95.44	95.12	95.52	94.80	95.38	94.66
	TN101 H.31	TN102 H.32	TN103 H.33	TN104 H.34	TN105 H.35	TN106 H.36	TN107 H.37	TN108 H.38	TN109 H.39	TN110 H.40
	95.92	96.01	95.96	94.05	94.32	94.13	95.40	95.95	95.91	95.69
	TN91 H.41	TN92 H.42	TN93 H.43	TN94 H.44	TN95 H.45	TN96 H.46	TN97 H.47	TN98 H.48	TN99 H.49	TN100 H.50
	95.42	95.55	95.72	95.43	95.27	96.04	94.04	95.17	95.50	94.36
	TN101 H.51	TN102 H.52	TN103 H.53	TN104 H.54	TN105 H.55	TN106 H.56	TN107 H.57	TN108 H.58	TN109 H.59	TN110 H.60
	95.77	96.03	95.87	94.24	94.09	94.18	94.23	94.49	94.37	94.11
	TN91 H.61	TN92 H.62	TN93 H.63	TN94 H.64	TN95 H.65	TN96 H.66	TN97 H.67	TN98 H.68	TN99 H.69	TN100 H.70
	95.38	95.58	95.51	95.68	95.40	96.00	94.40	95.33	94.93	94.17
	TN101 H.71	TN102 H.72	TN103 H.73	TN104 H.74	TN105 H.75	TN106 H.76	TN107 H.77	TN108 H.78	TN109 H.79	TN110 H.80
	95.00	94.83	95.74	94.45	94.56	94.26	94.31	94.94	94.66	94.26
	TN91 H.81	TN92 H.82	TN93 H.83	TN94 H.84	TN95 H.85	TN96 H.86	TN97 H.87	TN98 H.88	TN99 H.89	TN100 H.90
	95.10	95.00	94.72	94.84	95.06	96.01	94.29	95.61	95.06	95.06
	TN101 H.91	TN102 H.92	TN103 H.93	TN104 H.94	TN105 H.95	TN106 H.96				
	95.86	95.91	95.71	94.35	94.36	95.79				

Approved By._____

FM-TL05 I02/27-03-68

SCG
Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
105	TN91 H.1	TN92 H.2	TN93 H.3	TN94 H.4	TN95 H.5	TN96 H.6	TN97 H.7	TN98 H.8	TN99 H.9	TN100 H.10
	105.58	105.67	105.62	105.52	105.37	105.69	104.52	105.19	104.69	104.78
	TN101 H.11	TN102 H.12	TN103 H.13	TN104 H.14	TN105 H.15	TN106 H.16	TN107 H.17	TN108 H.18	TN109 H.19	TN110 H.20
	104.99	104.68	104.31	104.54	104.98	104.86	104.97	105.65	105.43	105.18
	TN91 H.21	TN92 H.22	TN93 H.23	TN94 H.24	TN95 H.25	TN96 H.26	TN97 H.27	TN98 H.28	TN99 H.29	TN100 H.30
	105.58	105.67	105.62	105.52	105.37	105.69	104.52	105.19	104.69	104.78
	TN101 H.31	TN102 H.32	TN103 H.33	TN104 H.34	TN105 H.35	TN106 H.36	TN107 H.37	TN108 H.38	TN109 H.39	TN110 H.40
	104.99	104.68	104.31	104.54	104.98	104.86	104.97	105.65	105.43	105.18
	TN91 H.41	TN92 H.42	TN93 H.43	TN94 H.44	TN95 H.45	TN96 H.46	TN97 H.47	TN98 H.48	TN99 H.49	TN100 H.50
	105.78	105.77	105.61	105.55	105.13	105.88	104.59	105.91	105.75	104.49
	TN101 H.51	TN102 H.52	TN103 H.53	TN104 H.54	TN105 H.55	TN106 H.56	TN107 H.57	TN108 H.58	TN109 H.59	TN110 H.60
	105.33	105.53	105.68	104.33	104.61	104.24	104.44	104.76	104.48	104.18
	TN91 H.61	TN92 H.62	TN93 H.63	TN94 H.64	TN95 H.65	TN96 H.66	TN97 H.67	TN98 H.68	TN99 H.69	TN100 H.70
	105.60	105.62	105.53	105.80	105.27	105.85	104.31	105.58	104.73	104.23
	TN101 H.71	TN102 H.72	TN103 H.73	TN104 H.74	TN105 H.75	TN106 H.76	TN107 H.77	TN108 H.78	TN109 H.79	TN110 H.80
	104.89	105.25	105.83	104.33	104.58	104.41	104.76	105.29	104.95	104.55
	TN91 H.81	TN92 H.82	TN93 H.83	TN94 H.84	TN95 H.85	TN96 H.86	TN97 H.87	TN98 H.88	TN99 H.89	TN100 H.90
	105.00	105.03	104.49	104.77	105.08	105.69	104.12	105.53	105.06	104.13
	TN101 H.91	TN102 H.92	TN103 H.93	TN104 H.94	TN105 H.95	TN106 H.96				
	105.71	105.71	105.67	104.99	105.15	104.52				

Approved By._____

FM-TL05 I02/27-03-68

SCG

Metrology Center

SCI ECO Services Company Limited

51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980 Page 6 of 6

Calibration Report

Measurement Results

Hot Block			Temperature Distribution			
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uncertainty (±°C)	Coverage Factor k
	Min , Max	Average				
94.0	-	94.0	95.31	0.20	0.90	2.00
104.0	-	104.0	105.74	0.20	1.10	2.00

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate

Approved By.

FM-TL.05 I02/27-03-68

RYG_EN0223

ALS Laboratory Group (Thailand) Co., Ltd.

Automatic Mercury Analyzer

RA-7000A with SANPRA ™3

INSTALLATION REPORT

SERIAL No. RA-7000A :	251040235
Soft version :	Ver 1.5.0.0
ROM version :	Ver 1.5.0.00
SERIAL No. SANPRA 3 :	241070094
ROM version :	Ver 1.4.2.00

REVIEW BY Thanitsak.

APPROVED BY

NEXT CAL. DATE 31 Jul 2026

DATE : 21 JULY 2025

DUE DATE : 21 JULY 2026

INSPECTED BY : Chayanan T.

(Cháyanan T.)

APPROVED BY : Natthaphong P.

(Natthaphong P.)

Kinetic Solutions Company Limited.

2, Soi Lat Krabang 1, Lat Krabang Subdistrict,

Lat Krabang District, Bangkok 10520

Tel. (+66) 062-789-5221

บริษัท คิเนติก โซลูชั่นส์ จำกัด
KINETIC SOLUTIONS CO.,LTD.

Inspection

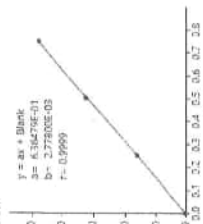
ITEMS		SPECIFICATIONS	RESULT	JUDGE
1. Quantity	-	Accessories are completed.	GOOD	OK
2. Appearance	2.1 Overall Appearance	No visible damage.	GOOD	OK
	2.2 Parts / Cables	Correctly placed and connected.	GOOD	
3. Indication	Nameplate / Label	Plate and Label are indicated.	GOOD	OK
4. Self check	-	All items are "PASS"	GOOD	OK
5. Calibration Curve	5.1 LOW	0-0.15 µg/L : Max.Dev. 5.0%	3.00%	OK
6. Repeatability	0.05 µg/L (n=5)	Average: 0.05 ± 0.0025 µg/L	0.0498 µg/L	OK
		C.V. ≤ 3.0%	1.69%	OK
7. Blank	After 40ppb	Less than 0.02 (AREA)	0.005	OK
7. Blank	MDL	3 x S.D. < 0.5ppt	0.40219	OK

TITLE 0.0_15ug/L
DATE 2025/07/18 14:07
UNIT RA-7000A[SN:251040235] + SANPRA 3 (UNIT A)[SN:241070094]
OPERATOR Kinetic Solutions

METHOD
Method Name : Method1
Pretreatment : No

P1: (1+1)H2SO4 : 0.5mL
P2: 10w/v% SnCl2 : 0.5mL

CALIBRATION



STD TABLE

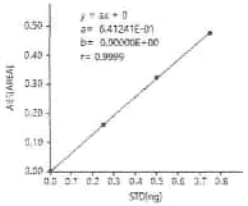
No.	SMP NO.	STD [ug/L]	SVOL [mL]	DVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	DEV [%]	NOTE
1	14	10.000	0.000	5.000	5.000	0.000	0.002718	0.0000	-	
2	2	10.000	0.025	5.000	5.000	0.250	0.161649	0.2496	0.2	
3	11	10.000	0.050	5.000	5.000	0.500	0.324423	0.5054	1.1	
4	10	10.000	0.075	5.000	5.000	0.750	0.477990	0.7466	0.5	

Nippon Instruments Corporation

1

TITLE MDL
DATE 2025/07/22 09:05
UNIT RA-7000A[SN:251040235] + SANPRA 3 (UNIT A)[SN:2410700094]
OPERATOR Kinetic Solutions

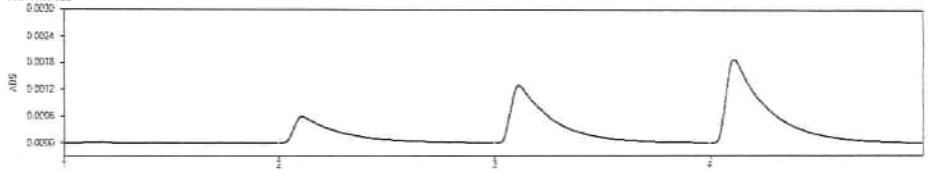
CALIBRATION



STD TABLE

No.	SMP NO.	STD [ug/L]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	DEV [%]	NOTE
1	14	10.000	0.000	5.000	5.000	0.000	0.002778	0.0043	-	
2	2	10.000	0.025	5.000	5.000	0.250	0.161649	0.2521	0.8	
3	11	10.000	0.050	5.000	5.000	0.500	0.324423	0.5059	1.2	
4	10	10.000	0.075	5.000	5.000	0.750	0.477950	0.7454	0.6	

STD PROFILE



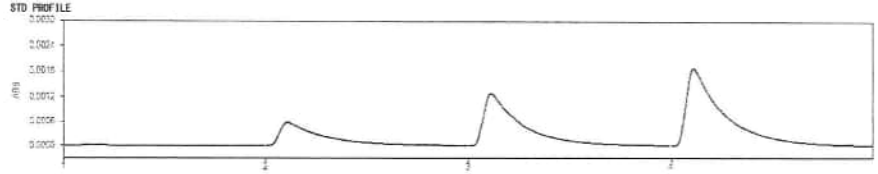
SMP TABLE

No.	SMP NO.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	RECOVERY [%]	NOTE
1	38	Check STD(0.050ug/L)	5.000	5.000	5.000	0.160103	0.2472	0.049	98.0	
2	39	Check STD(0.050ug/L)	5.000	5.000	5.000	0.157533	0.2431	0.049	98.0	
3	40	Check STD(0.050ug/L)	5.000	5.000	5.000	0.162128	0.2504	0.050	100.0	
4	41	Check STD(0.050ug/L)	5.000	5.000	5.000	0.161676	0.2497	0.050	100.0	
5	43	Check STD(0.050ug/L)	5.000	5.000	5.000	0.165449	0.2556	0.051	102.0	

STATISTICS

No.	NAME	DATA POINTS	AVE [ug/L]	SD [ug/L]	CV [%]
1	Check STD(0.050ug/L)	5	0.0498	0.00084	1.69

STD PROFILE



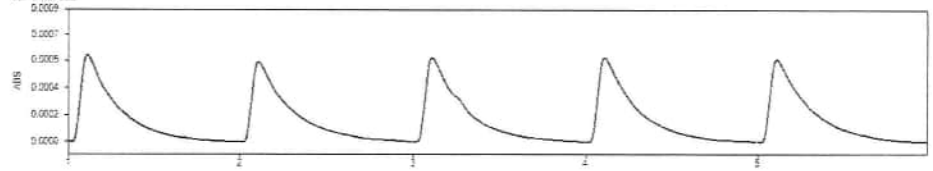
SMP TABLE

No.	SMP NO.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ppt]	NOTE
1	11	MDL	5.000	5.000	5.000	0.005288	0.0082	1.640000	
2	12	MDL	5.000	5.000	5.000	0.005637	0.0088	1.760000	
3	14	MDL	5.000	5.000	5.000	0.004926	0.0077	1.540000	
4	15	MDL	5.000	5.000	5.000	0.005025	0.0078	1.560000	
5	12	MDL	5.000	5.000	5.000	0.004222	0.0066	1.320000	
6	14	MDL	5.000	5.000	5.000	0.004279	0.0067	1.340000	
7	14	MDL	5.000	5.000	5.000	0.004938	0.0077	1.540000	
8	13	MDL	5.000	5.000	5.000	0.005120	0.0080	1.600000	
9	14	MDL	5.000	5.000	5.000	0.004594	0.0072	1.440000	
10	15	MDL	5.000	5.000	5.000	0.005055	0.0079	1.580000	

STATISTICS

No.	NAME	DATA POINTS	AVE [ppt]	SD [ppt]	CV [%]
1	MDL	10	1.532000	0.1340647	8.75

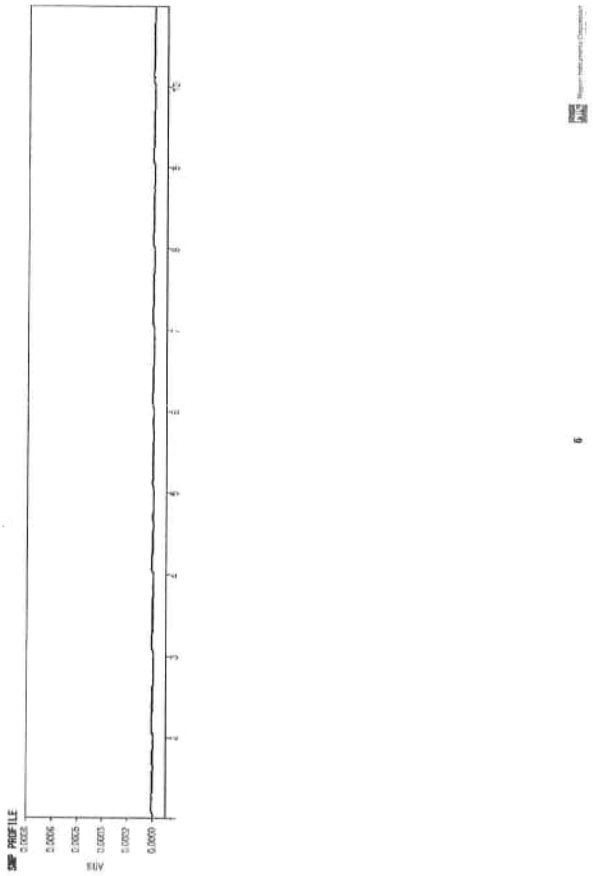
SMP PROFILE



SELF CHECK
Date : 2025/07/18 17:22:09

GLP Counter
Mercury Lamp(5000hr) : PASS 3hr (2025/05/09)
Membrane Filter(2000hr) : PASS 1hr (2025/05/09)
Air Pump(2000hr) : PASS 1hr (2025/05/09)
Drain Pump Tube(700hr) : PASS 0hr (2025/05/09)
No. of Measurements : 35
Adsorbed Hg(1000mg) : PASS 0.00004mg (2025/05/09)
P1 Tube(700hr) : PASS 0hr (2025/05/09)
P2 Tube(700hr) : PASS 0hr (2025/05/09)
P3 Tube(700hr) : PASS 0hr (2025/05/09)
P4 Tube(700hr) : PASS 0hr (2025/05/09)
P5 Tube(700hr) : PASS 0hr (2025/05/09)

Check/Test Result
Flow Rate Adjustment : PASS (FLOW=0.20L/min[DUTY= 50])
Sig/Ref : PASS (Sig:3.98V, Ref:4.02V)
Drift : PASS (DRIFT ABS= 0.0000162)
Sample Tube Sensor : PASS



Automation Service Co.,Ltd.

Head Office : 929,929/1 Soi Pattanakarn 30, Pattanakarn Road, Suanluang, Bangkok
Tel: 02-319-9994
www.automation.co.th

Sales & Service Center
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Lamphun : 122/5 M.4, Ban Klang, Muang, Lamphun 51000 [T. 053-581-876]
Prachinburi : 668 M.10, Thatum, Srimahaphote, Prachinburi 25140 [T. 037-209-860]

BKK_EN0066

MTOC : L-0617/2025 Report No. : ALS-416

TOC-L Maintenance Report

Instrument	: Total Organic Carbon Analyzer	Measuring	: TC 0 – 30000 mg/L
Model	: TOC-LCSH	Place of Installation	: -
Serial No.	: H54425300416	Department	: LABORATORY
Manufacture	: Shimadzu		

Customer: ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaen Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand

Date of Maintenance : 27 / 06 / 2025

REVIEW BY Uaan S.
APPROVED BY Sirijuk B.
NEXT CAL. DATE 27/6/26

Ambient Condition : Temperature 25.5 ± 5 °C
: Humidifier 58 ± 15 %RH

Maintenance By : Teeraphat Kamlungkua
(Mr. Teeraphat Kamlungkua)
Technician

Approved By :
(Mr. Nipon Phungsomsak)
Technician Manager

User Name : Sirijuk B.
(Miss Sirijuk Bunnak)

Automation Service Co.,Ltd.

Head Office : 929,929/1 Soi Pattanakarn 30, Pattanakarn Road, Suanluang, Bangkok
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Prachinburi : 668 M.10, Thatum, Srimahaphote, Prachinburi 25140 [T. 037-209-860]

MTOC : L-0617/2025 Report No. : ALS-416

Maintenance Sheet

Customer : ALS Laboratory Date : 27 / 06 / 2025
Model : TOC-LCSH Serial No. H54425300416

Item	Carry out maintenance work	Result	Exchange	Comment
1.	Check functionality of the device			
	Check furnace temperature (Standard cat. 680 °C / for TN cat. 720 °C)	O.K.		
	Check dehumidifier temperature (1 °C)	O.K.		
	Check the entire flow line related to leakage	O.K.		
	Check baseline status (OK)	O.K.		
	Check carrier gas pressure (200 ±10 kPa)	O.K.		
	Check carrier gas flow rate (150 mL/min)	O.K.		
2.	Tubes			
	Check all tubing for contamination, if necessary clean them	O.K.		
	Check all tubing for tight connection	O.K.		
3.	Container and Drainage			
	Fill up humidifier with pure water to max. level	O.K.		
	Check filling of dilution water and acid container	O.K.		
	Rinse Drain Pot, after wards refill again with pure water	O.K.		
	Check if outlet flow is in proper conditions	O.K.		
4.	TC and IC Injection			
	Clean injector Block	O.K.		
	Check injector Block for wear	O.K.		
	Check injection tube adjustment	O.K.		
	Check injection for leakage	O.K.		
	Check injection for clogging	O.K.		
5.	IC Measurement (N-type)			
	Check acidification in syringe			
	Check sparging in syringe			
6.	Eye check of 8-Port valve, for sample residues or moist spots that indicate possible leakage	O.K.		
7.	Check and if necessary exchange consumable, Maintenance parts	O.K.		See list of consumable, maintenance parts

Inspection by : Teeraphat Kamlungkua
(Mr. Teeraphat Kamlungkua)
Technician

Automation Service Co.,Ltd.

Head Office : 929,929/1 Soi Pattanakarn 30, Pattanakarn Road, Suanluang, Bangkok
Tel: 02-319-9994
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Sales & Service Center
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Prachinburi : 668 M.10, Thatum, Srimahaphote, Prachinburi 25140 [T. 037-209-860]

MTOC : L-0617/2025 Report No. : ALS-416

Item	Carry out maintenance work	Result	Exchange	Comment
8.	Due to instrument condition, clean the instrument inside and outside.	O.K.		
9.	After checking the system and exchanging of consumable and maintenance parts a new 1-3 point calibration have to be done.	O.K.		Addition test 1.
10.	After wards the calibration perform check sample measurement.	O.K.		Addition test 2.

Addition test

Test no.	Test conditions	Meas. value	Result
1.	Calibration TC standard solution at 0, 0.1, 0.5, 1, 5 10, 20 Injection volume 50 µL No. of measurement 2 times (Max.3)		Attachment : ALS-416 Page 1/4 –2/4
	Criteria : R^2 = 0.995 or more	0.9999	Pass
2.	Measurement of reagent water and TC standard solution at 5.0 mg/L Injection volume 50 µL No. of measurement 2 times (Max.3) and calculate accuracy by Meas. of TC standard – Meas. of Reagent water		Attachment : ALS-416 Page 3/4 – 4/4
	Criteria : Accuracy %Recovery 10% or less	5.244 – 0.1797 = 5.064 ppm	Pass

Inspection by : Teeraphat Kamlungkua
(Mr. Teeraphat Kamlungkua)
Technician

Automation Service Co.,Ltd.
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Lamphun : 192/6 M.4, Ban Klang, Muang, Lamphun 51000 [T. 053-581-076]
Prachinburi : 688 M.10, Thatum, Srimahaphote, Prachinburi 25140 [T. 037-208-860]

MTOC : L-0617/2025 Report No. : ALS-416

List of Consumable, Maintenance parts

Pos.	Part Number	Part Name	Result	Exchange	Recommended Interval
1.	036-11209-84	O-ring, 4D P10A (Viton , for TC,IC Slider)	O.K.		1 time per year, Depending on condition
2.	036-11219-84	O-ring, 4D P20 (for sealing TC-Combustion tube)	O.K.	√	1 time per year, Depending on condition
3.	638-15025	O-ring, PIFE (for TC,IC-Slider)	O.K.		1 time per year, Depending on condition
4.	630-00105-01	Platinum net, (2pcs-set) (to support catalyst)	O.K.	√	6 month same time as catalyst exchange
5.	630-00557	Silica Wool (to support catalyst)	O.K.	√	6 month same time as catalyst exchange
6.	630-00992	Halogen Scrubber	O.K.	√	6 month
7.	630-00996	High Sensitivity TC Catalyst (When installed)	N/A		Depending on condition
8.	638-60116	Regular Catalyst (33g) (When installed)	O.K.	√	6 month
9.	638-56251-01	8-Port valve rotor	O.K.	√	1 time per year
10.	638-41323	TC-Combustion Tube	O.K.	√	6 month same time as catalyst exchange
11.	631-43404-01	Packing, gasket slider (for TC-Injection tube)	O.K.		1 time per year, Depending on condition
12.	638-59296	Syringe 5mL	O.K.		Depending on condition
13.	638-59296-01	Plunger Tip (for syringe 5mL)	O.K.	√	6 month
14.	042-00405-11	IC reagent supply pump head	O.K.		1 time per year
15.	630-00999	CO2-Absorber (for cell space purge)	O.K.	√	1 time per year
16	630-00964	Molecular Sieves 13x	O.K.		1 time per year

Note. Table indicates the guidelines replacement periods when NPOC measurement is performed on sample that are comparatively as clean as tap water ,use standard catalyst and at a rate of about 500 sample per month (operating five days a week)

Inspector By Teeraphat Kamlungkua
(Mr. Teeraphat Kamlungkua)
Technician

SHIMADZU ANALYZER
4/4

TOC-Control L Report

ALS
2025_06_27_001_PM.tlx

Instr.Information

Instrument Options	TOC/ASI/IC Unit/
Catalyst	Regular Sensitivity

Cal. Curve

Sample Name:	Untitled
Sample ID:	Untitled
Cal. Curve:	TC 0.1 - 20 ppm 2025_06_27_13_27_34.cal
Status	Completed

Type	Anal
Standard	TC

Conc: 0.000mg/L

No.	Area	Sig.Val.	Acq. Cnt.	Rem.	Ex.	Date / Time
1	0.3383	80x2	1.000	*******		6/27/2025 1:30:33 PM
2	0.3474	80x2	1.000	*******		6/27/2025 1:32:43 PM

Acid Add.	0.000%	
Mean Area	0.3429	
SD Area	0.00684	
CV Area	1.99%	

Signal[mV] 10 6 3 -1 0 2 4 6 8 10 12 14 16 18 20 Time[min]

Conc: 0.1000mg/L

No.	Area	Sig.Val.	Acq. Cnt.	Rem.	Ex.	Date / Time
1	0.8247	80x2	1.000	*******		6/27/2025 1:39:33 PM
2	0.8413	80x2	1.000	*******		6/27/2025 1:42:22 PM

Acid Add.	0.000%	
Mean Area	0.8330	
SD Area	0.01383	
CV Area	2.24%	

Signal[mV] 10 6 3 -1 0 2 4 6 8 10 12 14 16 18 20 Time[min]

Conc: 0.5000mg/L

No.	Area	Sig.Val.	Acq. Cnt.	Rem.	Ex.	Date / Time
1	2.997	80x2	2.000	*******		6/27/2025 1:44:33 PM
2	2.898	80x2	2.000	*******	E	6/27/2025 1:46:44 PM
3	1.895	80x2	2.000	*******	E	6/27/2025 1:52:38 PM
4	2.014	80x2	2.000	*******		6/27/2025 1:55:05 PM

Acid Add.	0.000%	
Mean Area	2.056	
SD Area	0.05869	
CV Area	2.86%	

Signal[mV] 10 6 3 -1 0 2 4 6 8 10 12 14 16 18 20 Time[min]

Conc: 1.000mg/L

TOC-Control L Report

ALS
2025_06_27_001_PM.tlx

No.	Area	Sig.Val.	Acq. Cnt.	Rem.	Ex.	Date / Time
1	5.320	80x2	1.000	*******	E	6/27/2025 1:58:14 PM
2	5.707	80x2	1.000	*******		6/27/2025 2:00:24 PM
3	5.501	80x2	1.000	*******		6/27/2025 2:02:50 PM

Acid Add.	0.000%	
Mean Area	5.503	
SD Area	0.09283	
CV Area	0.69%	

Signal[mV] 10 6 3 -1 0 2 4 6 8 10 12 14 16 18 20 Time[min]

Conc: 5.000mg/L

No.	Area	Sig.Val.	Acq. Cnt.	Rem.	Ex.	Date / Time
1	14.19	80x2	4.000	*******		6/27/2025 2:09:44 PM
2	14.44	80x2	4.000	*******		6/27/2025 2:12:33 PM

Acid Add.	0.000%	
Mean Area	14.32	
SD Area	0.1838	
CV Area	1.28%	

Signal[mV] 10 6 3 -1 0 2 4 6 8 10 12 14 16 18 20 Time[min]

Conc: 10.00mg/L

No.	Area	Sig.Val.	Acq. Cnt.	Rem.	Ex.	Date / Time
1	28.15	80x2	2.000	*******		6/27/2025 2:19:00 PM
2	28.36	80x2	2.000	*******		6/27/2025 2:21:35 PM

Acid Add.	0.000%	
Mean Area	28.26	
SD Area	0.1485	
CV Area	0.53%	

Signal[mV] 10 6 3 -1 0 2 4 6 8 10 12 14 16 18 20 Time[min]

Conc: 20.00mg/L

No.	Area	Sig.Val.	Acq. Cnt.	Rem.	Ex.	Date / Time
1	55.08	80x2	1.000	*******		6/27/2025 2:25:19 PM
2	54.65	80x2	1.000	*******		6/27/2025 2:27:50 PM

Acid Add.	0.000%	
Mean Area	54.87	
SD Area	0.3546	
CV Area	0.46%	

Signal[mV] 20 14 7 -2 0 2 4 6 8 10 12 14 16 18 20 Time[min]

Slope:	2.721
Intercept	0.000
r^2	0.9999
r	0.9999
RSE[%]	N/A
Zero Shift	No

Area 60.357 50 40 30 20 10 0 0 2 4 6 8 10 12 14 16 18 20 22 Conc[mg/L]

TOC-Control L Report

ALS
2025_06_27_001_PM.tlx

Instr.Information

Instrument Options	TOC/ASI/IC Unit/
Catalyst	Regular Sensitivity

Sample

Sample Name:	water
Sample ID:	Untitled
Origin:	TC 0.1 - 20 ppm.cal
Status	Completed
Chk. Result	

Type	Anal	Manual Dilution	Result
Unknown	TC	1.000	TC 0.1197mg/L

1. Det

Anal.: TC

No.	Area	Conc.	Sig.Val.	Acq. Cnt.	Ex.	Calc.Curve	Date / Time
1	0.3310	0.1215mg/L	80x2	1.000		TC 0.1 - 20 ppm 2025_06_27_13_27_34.cal	6/27/2025 2:35:10 PM
2	0.4071	0.1180mg/L	80x2	1.000		TC 0.1 - 20 ppm 2025_06_27_13_27_34.cal	6/27/2025 2:37:00 PM

Mean Area	0.4890	
Mean Conc.	0.1197mg/L	

Signal[mV] 10 6 3 -1 0 2 4 6 8 10 12 14 16 18 20 Time[min]

TOC-Control L Report

ALS
2025_06_27_001_PM.tls

Instr.Information

Instrument Option: TOC/ASI/IC Unit/
Catalyst: Regular Sensitivity

Sample

Sample Name: Std. TC
Sample ID: 5 ppm
Origin: TC 0.1 - 20 ppm std
Status: Completed
Chk. Result:

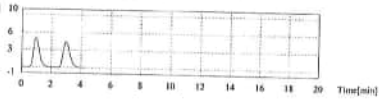
Type	Name	Injection Date/Time	Result
Unknown	TC	1.000	TC 5.244mg/L

1. Det

Anal.: TC

No.	R.Time	Conc.	Peak Area	Area Ratio	Det.	Data Name	Date/Time
1	14.34	5.244mg/L	502	1.000		TC 0.1 - 20 ppm 2025_06_27_13_27_38.qld	6/27/2025 1:33:33 PM
2	14.36	5.244mg/L	502	1.000		TC 0.1 - 20 ppm 2025_06_27_13_33_24.qld	6/27/2025 1:40:04 PM

Mean Area: 14.27
Mean Conc.: 5.244mg/L



1/1

6/27/2025 1:04:24 PM

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Prachinburi : 688 M.10, Thatum, Srimahaphote, Prachinburi 25140 [T. 037-208-880]

MTOC : L-0618/2025 Report No. : ALS-799

ASI Maintenance Report

Instrument	: Automatic Sample Injector	Measuring	: Vial 40 mL
Model	: ASI-L	Place of Installation	: -
Serial No.	: H57415200799	Department	: LABOLATORY
Manufacture	: Shimadzu		

Customer: ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaen Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand

Date of Maintenance : 27 / 06 / 2025

Ambient Condition : Temperature 25.5 ± 5 °C
: Humidifier 58 ± 15 %RH

REVIEW BY Ubon S.
APPROVED BY Siriluk B
NEXT CAL. DATE 27/6/26

Maintenance By : Teeraphat Kamlungkua
(Mr. Teeraphat Kamlungkua)
Technician

Approved By :
(Mr. Nipon Phungsomsak)
Technician Manager

User Name : Siriluk B.
(Miss Siriluk Bunnak.)

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Prachinburi : 688 M.10, Thatum, Srimahaphote, Prachinburi 25140 [T. 037-208-880]

MTOC : L-0618/2025 Report No. : ALS-799

Maintenance Sheet

Customer : ALS Laboratory Date : 27 / 06 / 2025

Model : ASI-L Serial No. H57415200799

Item	Carry out maintenance work	Result	Exchange	Comment
1.	Arm Drive section	O.K.		
	Check Arm Drive Belt for wear and tension	O.K.		
	Check grease of Screw Arm Drive	O.K.		
2.	Rinse pump (only ASI-V 24ml, 40ml)	O.K.		
	Check pump rate(>40mL/min)	O.K.		
	Check pump and tube connection for leakage	O.K.		
	Check if outlet flow is in proper condition	O.K.		
3.	Check and if necessary exchange consumable, Maintenance parts	O.K.		See appropriate list of maintenance parts
4.	Check Stirrer [When installed]	O.K.		
5.	Verify ASI function via mechanical check	O.K.		

Inspection by : Teeraphat Kamlungkua
(Mr. Teeraphat Kamlungkua)
Technician

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Prachinburi : 688 M.10, Thatum, Srimahaphote, Prachinburi 25140 [T. 037-208-880]

MTOC : L-0618/2025 Report No. : ALS-799

List of Consumable, Maintenance parts

Pos.	Part Number	Part Name	Result	Exchange	Recommended Interval
1.	017-27021-01	Grease Paste, Lubricant 100g	O.K.	√	1 time per year
2.	032-22661-02	Belt, 60S2m596, Arm Drive	O.K.		1 time per year Depending on condition
3.	034-03067-02	Spring, F-642, Arm Drive	O.K.		Depending on condition
4.	042-00405-11	Pump Head, for ASI Rinse Pump (only ASI-V 24mL, 40mL)	O.K.		After 300 h of operating
5.	638-41448-01	Std. Needle Type1 24mL, 40mL* (for tube 2, 1x1, 6),[Sparge needle]	N/A		Depending on condition
6.	638-41448-02	Std. Needle Type1 125mL* (for tube 2, 1x1, 6)	N/A		Depending on condition
7.	631-41660-03	Flare Pipe 2x1,5x700mm* (for Standard Needle Type1 24mL,40mL, 125mL)	N/A		Depending on condition (may cut to origin length 600mm)
8.	638-41450-01	Needle for Suspended Particles,* 0,8mm (only ASI-V 24mL, 40mL)	N/A		Depending on condition
9.	638-41450-01	Std. Needle Type2 125mL* (for tube 1,4x0,9)	N/A		Depending on condition
10.	638-41472-01	Std. Needle Type2 24mL, 40mL* (for tube 1,4x0,9)	O.K.		Depending on condition
11.	631-41660-02	Flare Pipe 1,4x0,9x600mm* (for Suspended + Needle Type2)	O.K.		Depending on condition
12.	638-41449-01	Double Needle , only 24mL,40mL (simultaneous sparge type)*	N/A		Depending on condition
13.	631-41660-01	Flare Pipe 1,1x0,6x600mm* (for Double Needle 24mL,40mL)	N/A		Depending on condition

*Note: needed parts depending on installed needle types!

Inspection by : Teeraphat Kamlungkua
(Mr. Teeraphat Kamlungkua)
Technician

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID:	GM-10
Organization Name:	ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location:	104 Patthanakarn 40, Patthanakarn Rd., Kwang Suan Luang, Khet Suan Luang, Bangkok 10250
Date:	November 21, 2025 4:19:13 PM
EQP Name:	AgilentRecommended , AgilentRecommended
EQP Revision:	GC.02.55, GCMS.02.56
Overall Qualification Status:	Pass

REVIEW BY Suchada T.
APPROVED BY Nant Sort
NEXT CAL. DATE 21-May-27

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front MMI

Setpoint Status: Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.0	psi
Accuracy:			0.0	psi
Agilent Recommended		<=	1.2	

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass

Zone: Oven

	Setpoint/Actual					
Temperature:	230.0	228.9	°C			
Accuracy:		-1.1	°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	101.0	°C			
Accuracy:		1.0	°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

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Tune EI

Tested Combination1 Front MMI / External TQ

Name: 7000D

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1 Front MMI / External TQ
Injection Tower

Name: 7693A

Source: EI - Extractor

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Instrument Detection Limit

Tested Combination1 Front MMI / External TQ
Injection Tower

Name: 7693A

Source: EI - Extractor

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Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

	Area		Retention Time	
Minimum RSD:	6.27	%	0.01	%
Agilent Recommended:	<= 12.00		<= 1.00	
Status:	Pass		Pass	

Instrument Detection Limit:	2.11008	fg
Agilent Recommended:	<= 4.03800	
Status:	Pass	

Overall Instrument Detection Limit Test Status

Pass

Mass Ratio Precision

Tested Combination1 Front MMI / External TQ
Injection Tower

Name: 7693A

Source: EI - Extractor

Setpoint Status: Pass

Injection Volume on Column: 0.5 uL

	Area Mass 1 Abundance*s		Mass Ratio	
RSD:	4.35	%	0.26	%
Agilent Recommended:	<= 5.00		<= 5.00	
	Pass		Pass	

Overall Mass Ratio Precision Test Status

Pass

NOTE: This test's 0 comment(s) and 3 deviation(s) are available in the Attachments section.

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-10
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

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

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN18180003
Firmware Revision	A.11.02
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN18170137
Firmware Revision	A.11.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN18163080
Firmware Revision	B.02.05
Oven Type	Standard

Inlet 1

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

Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
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	TQ
Name	7000D
Model Number	G7000D
Serial Number	US18260108
Firmware Revision	G.7000.085A
High Vacuum System	Turbo Pump
Liquid Injection Scouting Run Standard	OFN Std

MS EI Source 1

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

Electronic Signature

Purpose

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Details

Full Name of Signer:	Supasak Nimsongtham
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Signature Creation Date:	November 21, 2025
Reason for Signature:	Executed protocol and published this original version of document

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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: supreak.nimsongthum
Report Generated by Hostname: SCG11109HKC

System Id: GM-10
Print Date: November 21, 2025 4:10:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 9:34:45 AM	Audit	SessionCreated	Session	Host Name: SCG11109HKC, Drive Serial Number: C2031779
November 21, 2025 9:34:49 AM	start	Configuration	Session	None
November 21, 2025 9:34:49 AM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code.
November 21, 2025 9:35:07 AM	Audit	RptLoaded	Session	EQP details for primary technique [Gc]:- File path: [ProtocolFiles\Gc\Configuration\02.55\Gc 02.55.mpt], EQP File Name: [Gc 02.55.eqp], EQP Name: [AgilentRecommended] Protocol Revision: [Gc 02.55] EQP details for hyphenated technique [GcMs]:- File path: [ProtocolFiles\GcMs\Configuration\02.55\GcMs 02.55.mpt], EQP File Name: [GcMs 02.55.eqp], EQP Name: [AgilentRecommended]
November 21, 2025 9:35:11 AM	End	Configuration	Session	None
November 21, 2025 9:35:16 AM	start	Qualification	Session	OQ
November 21, 2025 9:35:16 AM	start	Execution	CDS Logon Verification - GC - 7890: - Qualitative test	None
November 21, 2025 9:58:13 AM	End	Execution	CDS Logon Verification - GC - 7890: - Qualitative test	Run Count : 1

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User Name: supreak.nimsongthum
Report Generated by Hostname: SCG11109HKC

System Id: GM-10
Print Date: November 21, 2025 4:10:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 9:58:15 AM	start	Execution	System Inspection and Basic Safety and Operation - 7820: - Qualitative Test - No setpoints associated	None
November 21, 2025 9:58:23 AM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1
November 21, 2025 9:58:54 AM	start	Execution	Inlet Pressure Accuracy - Front MMI: - Pressure Controlled Inlet - S: 25.0 psi - L: += 1.2 psi	None
November 21, 2025 9:59:07 AM	End	Execution	Inlet Pressure Accuracy - Front MMI: - Pressure Controlled Inlet - S: 25.0 psi - L: += 1.2 psi	Run Count : 1
November 21, 2025 9:59:08 AM	start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
November 21, 2025 10:06:29 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
November 21, 2025 10:06:51 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
November 21, 2025 10:07:15 AM	start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
November 21, 2025 10:10:39 AM	start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None

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User Name: supreak.nimsongthum
Report Generated by Hostname: SCG11109HKC

System Id: GM-10
Print Date: November 21, 2025 4:10:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 10:10:44 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
November 21, 2025 10:10:47 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
November 21, 2025 10:36:46 AM	start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
November 21, 2025 10:37:01 AM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
November 21, 2025 10:37:03 AM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
November 21, 2025 10:37:09 AM	start	Execution	Tune EI - 7000D TQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
November 21, 2025 10:37:32 AM	End	Execution	Tune EI - 7000D TQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
November 21, 2025 10:38:12 AM	start	Execution	Tune EI - 7000D TQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
November 21, 2025 10:38:35 AM	End	Execution	Tune EI - 7000D TQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated)	Run Count : 1

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User Name: supreak.nimsongthum
Report Generated by Hostname: SCG11109HKC

System Id: GM-10
Print Date: November 21, 2025 4:10:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 10:50:15 AM	Audit	AceClosed	Session	None
November 21, 2025 12:43:33 PM	Audit	AceRestarted	Session	Host Name: SCG11109HKC, Drive Serial Number: C2031779
November 21, 2025 12:43:34 PM	Audit	SessionReloaded	Session	None
November 21, 2025 12:43:56 PM	start	Qualification	Session	OQ
November 21, 2025 12:47:36 PM	start	Execution	Scouting Run - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
November 21, 2025 12:47:39 PM	Audit	AceClosed	Session	None
November 21, 2025 12:58:52 PM	Audit	AceRestarted	Session	Host Name: SCG11109HKC, Drive Serial Number: C2031779
November 21, 2025 12:58:53 PM	Audit	SessionReloaded	Session	None
November 21, 2025 12:59:22 PM	start	Qualification	Session	OQ
November 21, 2025 12:59:32 PM	start	Execution	Scouting Run - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
November 21, 2025 1:01:06 PM	Audit	Data	Scouting Run - Injection Tower, Front MMI, TQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Data files Path : C:\Users\supreak\OneDrive - Agilent Technologies\Documents\DM-11.002\25\data\Audit MI\ScoutingRun001.D

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User Name: supasak.chinsongthan
Report Generated by Hostname: SCG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 1:03:18 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: 500;Integration: Off at 0] Integration: On at 4]
November 21, 2025 1:01:22 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: Injection:Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 200;Integration: Off at 0] Integration: On at 4]
November 21, 2025 1:01:26 PM	End	Execution	Sequence Run - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - Path of GCMS System Preparation	Run Count : 1
November 21, 2025 1:01:29 PM	Alert	Execution	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	None
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_001.D

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User Name: supasak.chinsongthan
Report Generated by Hostname: SCG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_002.D
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_003.D
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_004.D
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_005.D
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_006.D
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_007.D

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Report Generated by Hostname: SCG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_008.D
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_009.D
November 21, 2025 1:02:12 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\VDL_010.D
November 21, 2025 1:03:37 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front MWL TQ: - Source: - EI - Extractor - RSD L (Area): <= 12.00% - RSD L (Ret. Time): <= 1.00%	Run Count : 1
November 21, 2025 1:03:47 PM	Alert	Execution	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
November 21, 2025 1:04:01 PM	Audit	AcqClosed	Session	None
November 21, 2025 2:06:06 PM	Audit	AcqRestarted	Session	Host Name: SCG1115HKC, Drive Serial Number: C2291770
November 21, 2025 2:06:09 PM	Audit	SessionReloaded	Session	None

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Report Generated by Hostname: SCG1115HKC

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 2:06:06 PM	Alert	Qualification	Session	OQ
November 21, 2025 2:08:58 PM	Alert	Execution	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
November 21, 2025 2:09:29 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\MRP_001.D
November 21, 2025 2:09:29 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\MRP_002.D
November 21, 2025 2:09:29 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\MRP_003.D
November 21, 2025 2:09:29 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\msongth\OneDrive - Agilent Technologies\Documents\GM -11 DQ2025\data id\data id\MRP_004.D

User Name: supasek.nimsongthan
Report Generated by Hostname: SCG1115HRC

System Id: GM-10
Print Date: November 21, 2025 4:19:13 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 2:09:29 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_005.D
November 21, 2025 2:03:29 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_004.D
November 21, 2025 2:00:58 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: 5000,Integration: Off at 0,Integration: On at 0]
November 21, 2025 2:11:25 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Run Count : 1
November 21, 2025 2:12:24 PM	Audit	TestUnlocked	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Decision Red for Run Count : 1
November 21, 2025 2:12:24 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	None

User Name: supasek.nimsongthan
Report Generated by Hostname: SCG1115HRC

System Id: GM-10
Print Date: November 21, 2025 4:19:13 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 2:13:04 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_001.D
November 21, 2025 2:13:04 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_002.D
November 21, 2025 2:13:04 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_003.D
November 21, 2025 2:13:04 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_004.D
November 21, 2025 2:13:04 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_005.D
November 21, 2025 2:13:04 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_006.D

User Name: supasek.nimsongthan
Report Generated by Hostname: SCG1115HRC

System Id: GM-10
Print Date: November 21, 2025 4:19:13 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 2:13:14 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: 5000,Integration: OFF at 0,Integration: ON at 9]
November 21, 2025 2:13:24 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Run Count : 2
November 21, 2025 2:14:33 PM	Audit	TestUnlocked	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Limit when End for Run Count : 2
November 21, 2025 2:14:33 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	None
November 21, 2025 2:15:55 PM	Audit	AcqClosed	Session	None
November 21, 2025 2:16:38 PM	Audit	AcqRestarted	Session	Host Name: SCG1115HRC Drive Serial Number: C2031778
November 21, 2025 2:16:38 PM	Audit	SessionReloaded	Session	None
November 21, 2025 2:17:00 PM	start	Qualification	Sequence	OQ
November 21, 2025 2:17:00 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	None

User Name: supasek.nimsongthan
Report Generated by Hostname: SCG1115HRC

System Id: GM-10
Print Date: November 21, 2025 4:19:13 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 2:17:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_001.D
November 21, 2025 2:17:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_002.D
November 21, 2025 2:17:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_003.D
November 21, 2025 2:17:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_004.D
November 21, 2025 2:17:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_005.D
November 21, 2025 2:17:46 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWL TQ: - Source: EI - Extractor - L (RSD) <= 5.00%	Data Files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM -11 GQ2025\data mrp\data mrp\MRP_007.D

User Name: supasak.nimsongtham System Id: GM-10
Report Generated by Hostname: SCG1115HKC Print Date: November 21, 2025 4:19:13 PM

GM-10 2026 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 2:18:01 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 100,Initial Peak Width: 0.01,Initial Area Reject: 0,Initial Height Reject: 5000,Integration: Off at 0,Integration: On at 6]
November 21, 2025 2:18:09 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 10,Initial Peak Width: 0.05,Initial Area Reject: 0,Initial Height Reject: 5000,Integration: Off at 0,Integration: On at 6]
November 21, 2025 2:18:18 PM	Audit	Reporting	Reintegration	Reintegration Count: 3 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 50,Initial Peak Width: 0.05,Initial Area Reject: 0,Initial Height Reject: 5000,Integration: Off at 0,Integration: On at 6]
November 21, 2025 2:18:24 PM	Audit	Reporting	Reintegration	Reintegration Count: 4 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 100,Initial Peak Width: 0.05,Initial Area Reject: 0,Initial Height Reject: 5000,Integration: Off at 0,Integration: On at 6]

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User Name: supasak.nimsongtham System Id: GM-10
Report Generated by Hostname: SCG1115HKC Print Date: November 21, 2025 4:19:13 PM

GM-10 2026 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 2:18:36 PM	Audit	Reporting	Reintegration	Reintegration Count: 5 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 100,Initial Peak Width: 0.001,Initial Area Reject: 0,Initial Height Reject: 5000,Integration: Off at 0,Integration: On at 6]
November 21, 2025 2:18:50 PM	Audit	Reporting	Reintegration	Reintegration Count: 6 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 100,Initial Peak Width: 0.001,Initial Area Reject: 0,Initial Height Reject: 5000,Integration: Off at 0,Integration: On at 6.5]
November 21, 2025 2:19:08 PM	Audit	Reporting	Reintegration	Reintegration Count: 7 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 100,Initial Peak Width: 0.01,Initial Area Reject: 0,Initial Height Reject: 5000,Integration: Off at 0,Integration: On at 6.5]

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User Name: supasak.nimsongtham System Id: GM-10
Report Generated by Hostname: SCG1115HKC Print Date: November 21, 2025 4:19:13 PM

GM-10 2026 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 2:19:23 PM	Audit	Reporting	Reintegration	Reintegration Count: 8 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 100,Initial Peak Width: 0.01,Initial Area Reject: 0,Initial Height Reject: 5000,Integration: Off at 0,Integration: On at 6.5]
November 21, 2025 2:12:47 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count: 3
November 21, 2025 2:21:49 PM	Audit	TestUnlocked	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Deviation Text for Run Count : 3
November 21, 2025 2:21:49 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
November 21, 2025 4:03:34 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2MRP031.D
November 21, 2025 4:03:34 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2MRP032.D

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User Name: supasak.nimsongtham System Id: GM-10
Report Generated by Hostname: SCG1115HKC Print Date: November 21, 2025 4:19:13 PM

GM-10 2026 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 4:03:34 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2MRP033.D
November 21, 2025 4:03:34 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2MRP034.D
November 21, 2025 4:03:34 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2MRP035.D
November 21, 2025 4:03:34 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MM1, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\nimsongth\OneDrive - Agilent Technologies\Documents\GM-11 OQ2025\mrp2\mrp2MRP036.D
November 21, 2025 4:03:46 PM	Audit	AceClosed	Session	None
November 21, 2025 4:05:37 PM	Audit	AceRestarted	Session	Host Name: SCG1115HKC Drive Serial Number: C2031778
November 21, 2025 4:05:38 PM	Audit	SessionReloaded	Session	None

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User Name: supasak.rinsongthani
Report Generated by Hostname: SCG1153H6C

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 4:06:03 PM	start	Qualification	Session	OQ
November 21, 2025 4:06:03 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front MWI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
November 21, 2025 4:06:14 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
November 21, 2025 4:07:14 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : E:\mp2\mp2MRP001.D
November 21, 2025 4:07:14 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : E:\mp2\mp2MRP002.D
November 21, 2025 4:07:14 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : E:\mp2\mp2MRP003.D
November 21, 2025 4:07:14 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : E:\mp2\mp2MRP004.D
November 21, 2025 4:07:14 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : E:\mp2\mp2MRP005.D
November 21, 2025 4:07:14 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front MWI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : E:\mp2\mp2MRP006.D

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User Name: supasak.rinsongthani
Report Generated by Hostname: SCG1153H6C

System Id: GM-10
Print Date: November 21, 2025 4:19:18 PM

GM-10 2025 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
November 21, 2025 4:07:34 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: 5000;Integration: Off at 0;Integration: On at 8]
November 21, 2025 4:07:45 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front MWI, TQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count : 4
November 21, 2025 4:07:56 PM	End	Qualification	Session	OQ
November 21, 2025 4:07:56 PM	start	Reporting	Session	None
November 21, 2025 4:18:37 PM	Audit	Reporting	Session	Report Generated : Certificate
November 21, 2025 4:19:46 PM	Audit	Reporting	Session	Report Generated : Report