

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



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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	BKK_FS0358	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0662	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0173	-	-	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_FS0731	5-Jan-26	5-Jul-26	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0463	5-Jan-26	5-Jul-26	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0732	5-Jan-26	5-Jul-26	6
Ambient	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Ambient	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Ambient	Total Hydrocarbon	Total Hydrocarbon Analyzer	RYG_FS0762	15-Jan-26	14-Jan-27	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0609	21-Jan-26	20-Jul-27	18
Stack (CEMs)	Oxides of Nitrogen	Analyzer , System calibration, Star	-	-	-	-
Stack	Acrylic Acid	Console Control Unit	BKK_FS0556	6-Jan-26	6-Jul-26	6
Stack	Acrylic Acid	Pitot Tube	BKK_FS0560	6-Jan-26	6-Jul-26	6
Stack	Acrylic Acid	Pitot Tube	BKK_FS0561	6-Jan-26	6-Jul-26	6
Stack	Acrylic Acid	Fuel Gas Analyzer	RYG_FS0565	23-Dec-25	22-Dec-26	12
Stack	Acrylic Acid	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Acrylic Acid	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Stack	Acrylic Acid	Air Sampling Pump	RYG_FS0106	6-Jan-26	6-Apr-26	3
Stack	Acrylic Acid	HPLC	BKK_FL0034	6-Jan-26	6-Jan-27	12
Stack	Methyl Methacrylate	Console Control Unit	BKK_FS0556	6-Jan-26	6-Jul-26	6
Stack	Methyl Methacrylate	Pitot Tube	BKK_FS0560	6-Jan-26	6-Jul-26	6
Stack	Methyl Methacrylate	Pitot Tube	BKK_FS0561	6-Jan-26	6-Jul-26	6
Stack	Methyl Methacrylate	Fuel Gas Analyzer	RYG_FS0565	23-Dec-25	22-Dec-26	12
Stack	Methyl Methacrylate	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Methyl Methacrylate	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Stack	Methyl Methacrylate	Air Sampling Pump	RYG_FS0106	6-Jan-26	6-Apr-26	3
Stack	Methyl Methacrylate	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12
Stack	Toluene	Console Control Unit	BKK_FS0556	6-Jan-26	6-Jul-26	6
Stack	Toluene	Pitot Tube	BKK_FS0560	6-Jan-26	6-Jul-26	6
Stack	Toluene	Pitot Tube	BKK_FS0561	6-Jan-26	6-Jul-26	6
Stack	Toluene	Fuel Gas Analyzer	RYG_FS0565	23-Dec-25	22-Dec-26	12
Stack	Toluene	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Toluene	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Stack	Toluene	Air Sampling Pump	RYG_FS0120	3-Jan-26	3-Apr-26	3
Stack	Toluene	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12
Stack	Methanol	Console Control Unit	BKK_FS0556	6-Jan-26	6-Jul-26	6
Stack	Methanol	Pitot Tube	BKK_FS0560	6-Jan-26	6-Jul-26	6
Stack	Methanol	Pitot Tube	BKK_FS0561	6-Jan-26	6-Jul-26	6
Stack	Methanol	Fuel Gas Analyzer	RYG_FS0565	23-Dec-25	22-Dec-26	12
Stack	Methanol	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Methanol	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Stack	Methanol	Air Sampling Pump	RYG_FS0126	6-Jan-26	6-Apr-26	3
Stack	Methanol	Air Sampling Pump	RYG_FS0120	3-Jan-26	3-Apr-26	3
Stack	Methanol	GC-FID	BKK_EN0126	22-Oct-25	21-Oct-26	12
Stack	Total Suspended Particulate	Console Control Unit	BKK_FS0556	6-Jan-26	6-Jul-26	6
Stack	Total Suspended Particulate	Pitot Tube	BKK_FS0560	6-Jan-26	6-Jul-26	6
Stack	Total Suspended Particulate	Pitot Tube	BKK_FS0561	6-Jan-26	6-Jul-26	6
Stack	Total Suspended Particulate	Fuel Gas Analyzer	RYG_FS0565	23-Dec-25	22-Dec-26	12
Stack	Total Suspended Particulate	Digital Balance	RYG_EN0003	3-Feb-26	3-Feb-27	12
Workplace	Acrylic Acid	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Acrylic Acid	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Acrylic Acid	HPLC	BKK_FL0034	6-Jan-26	6-Jan-27	12
Workplace	Methyl Metacrylate	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Methyl Metacrylate	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Methyl Metacrylate	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12
Workplace	Methyl Metacrylate	GC-MSD	BKK_EN0410	8-May-26	7-May-27	12
Workplace	Methanol	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Methanol	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Methanol	GC-FID	BKK_EN0126	22-Oct-25	21-Oct-26	12



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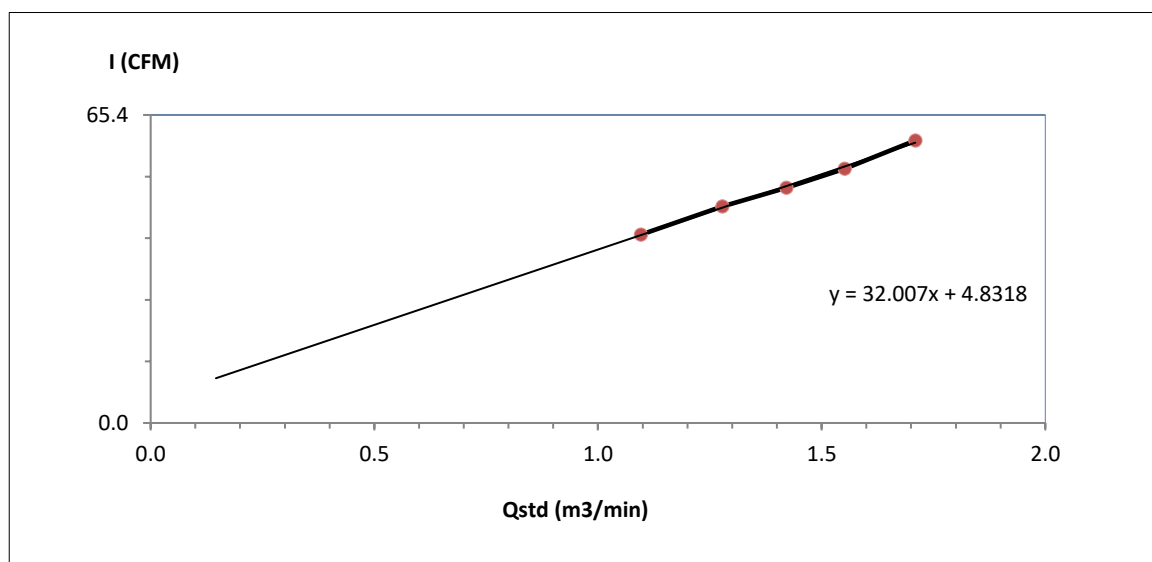
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Total Hydrocarbon	Total Hydrocarbon Analyzer	RYG_FS0762	15-Jan-26	14-Jan-27	12
Workplace	Toluene	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Toluene	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Toluene	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12
Workplace	Toluene	GC-MSD	BKK_EN0410	8-May-26	7-May-27	12
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0496	19-Mar-25	19-Mar-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0030	21-Jan-26	20-Jan-27	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0025	21-Jan-26	20-Jan-27	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0026	28-Jan-26	27-Jan-27	12
Noise	Leq 12 hrs	Sound Calibrator	RYG_FS0213	9-Jan-26	8-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0017	21-Jan-26	20-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0019	21-Jan-26	20-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0020	21-Jan-26	20-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0024	28-Jan-26	27-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0025	21-Jan-26	20-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0026	28-Jan-26	27-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0027	21-Jan-26	20-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0030	21-Jan-26	20-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0301	21-Jan-26	20-Jan-27	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0302	29-Oct-25	28-Oct-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0303	18-Aug-25	17-Aug-26	12
Noise	Leq 12 hrs	Sound Calibrator	RYG_FS0496	19-Mar-25	19-Mar-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0493	28-Jan-26	27-Jan-27	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0497	17-Sep-25	16-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	RYG_FS0036	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	RYG_FS0037	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	RYG_FS0038	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	RYG_FS0033	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	RYG_FS0034	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	RYG_FS0041	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	RYG_FS0035	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	RYG_FS0039	4-Sep-25	3-Sep-26	12
Rayong Lab	pH at 25 °C	pH Meter	RYG_EN0152	18-Jun-25	18-Dec-26	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	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	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_FS0596	25-Jun-25	25-Jun-26	12
Rayong Lab	Sulfate	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Residual Free Chlorine	Chamber (Cold Room)	RYG_EN0184	27-Nov-25	27-May-27	18



High Volume Air Sampler Calibration Worksheet

Project Site :	Thai MMA Co.,Ltd	Barometric Pressure (mm Hg) :	755.3
Calibrate Location :	SCG site 3	Temperature (°C) :	32.1
Calibrate Date :	2-Mar-26	High Volume ID :	BKK_FS0358
CalibrationSheet No.:	C-020326-BKK_FS0358	High Volume Model :	TE-5009X
Calibrator ID:	RYG_FS0205	High Volume S/N :	5193
Calibrator Model :	TE-5028A	Calibrator Slope :	1.51825
Calibrator S/N :	1166	Calibrator Intercept :	-0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.7	1.0959	40	Slope : 32.0066 Intercept : 4.8318 Correlation Coefficient : 0.9986
2	3.7	1.2779	46	
3	4.6	1.4214	50	
4	5.5	1.5515	54	
5	6.7	1.7093	60	



Calibrated by

(Mr. Santi Chaichana)
RYG Field Services Scientist (2)

Approved by :

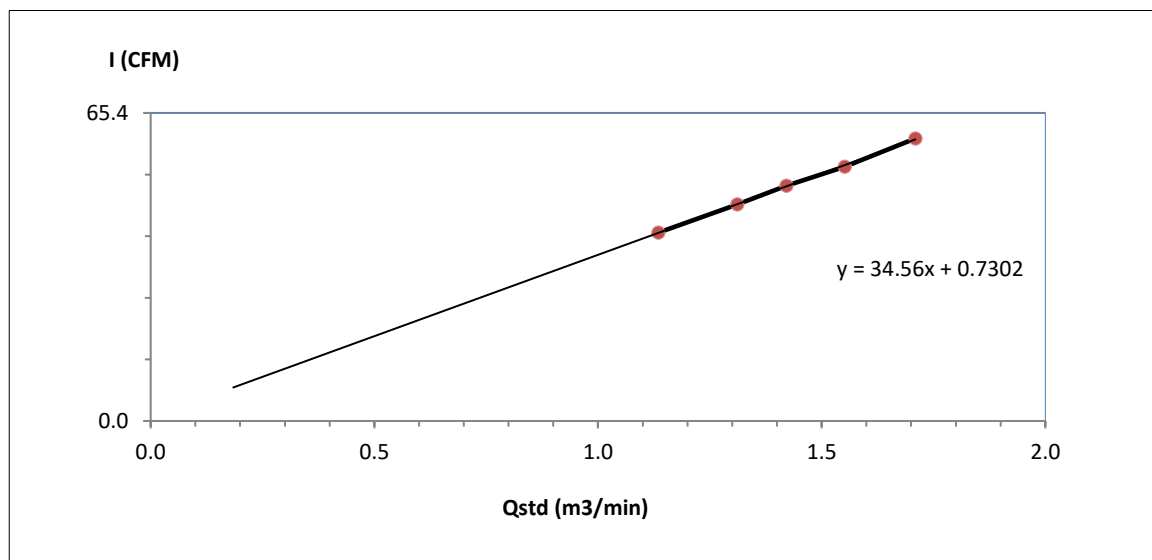
(Mr. Supot Salamteh)
Field Services Section Head



High Volume Air Sampler Calibration Worksheet

Project Site :	Thai MMA Co.,Ltd	Barometric Pressure (mm Hg) :	755.3
Calibrate Location :	วัดหนองแฟบ	Temperature (°C) :	32.1
Calibrate Date :	2-Mar-26	High Volume ID :	RYG_FS0662
CalibrationSheet No.:	C-020326-RYG_FS0662	High Volume Model :	TE-5009X
Calibrator ID:	RYG_FS0205	High Volume S/N :	6259
Calibrator Model :	TE-5028A	Calibrator Slope :	1.51825
Calibrator S/N :	1166	Calibrator Intercept :	-0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.9	1.1347	40	Slope : 34.5600 Intercept : 0.7302 Correlation Coefficient : 0.9996
2	3.9	1.3112	46	
3	4.6	1.4214	50	
4	5.5	1.5515	54	
5	6.7	1.7093	60	



Calibrated by

(Mr. Santi Chaichana)
RYG Field Services Scientist (2)

Approved by :

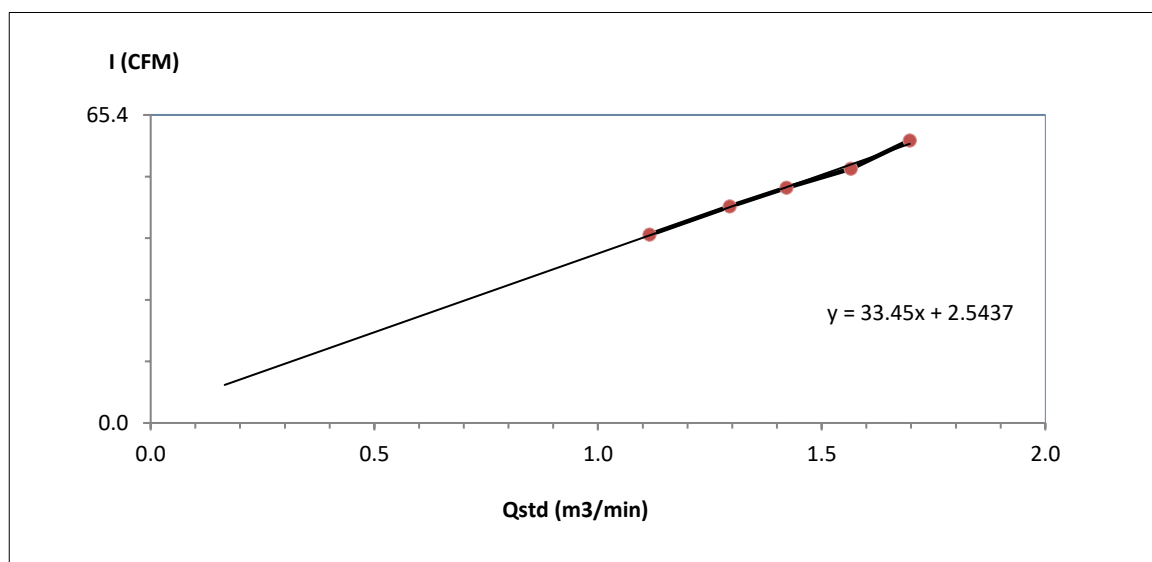
(Mr. Supot Salamteh)
Field Services Section Head



High Volume Air Sampler Calibration Worksheet

Project Site :	Thai MMA Co.,Ltd	Barometric Pressure (mm Hg) :	755.3
Calibrate Location :	รร.บ้านมาบตาพุด	Temperature (°C) :	32.1
Calibrate Date :	2-Mar-26	High Volume ID :	RYG_FS0173
CalibrationSheet No.:	C-020326-RYG_FS0173	High Volume Model :	TE-5170D
Calibrator ID:	RYG_FS0205	High Volume S/N :	4799
Calibrator Model :	TE-5028A	Calibrator Slope :	1.51825
Calibrator S/N :	1166	Calibrator Intercept :	-0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.8	1.1155	40	Slope : 33.4502 Intercept : 2.5437 Correlation Coefficient : 0.9971
2	3.8	1.2946	46	
3	4.6	1.4214	50	
4	5.6	1.5653	54	
5	6.6	1.6968	60	



Calibrated by

(Mr. Santi Chaichana)
RYG Field Services Scientist (2)

Approved by :

(Mr. Supot Salamteh)
Field Services Section Head

Accredited by

NSC-TISI-TIS 17025

Calibration 0426



Calibration certificate

Calibration Certificate No. 26BCI0067

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	LA130S-F	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.	25409664 RYG_EN0001	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	REVIEW BY <i>Thanita K.</i>
Number of pages	4	APPROVED BY <i>D. Khunon</i>
Date of calibration	03 Feb 2026	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	03 Feb 2026	Approval of the Calibration Certificate	Person in charge
			
		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. <i>T</i> _{weights} - <i>T</i> _{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
	<i>s</i> = 0.00007 g	<i>s</i> = 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\text{ g}$	

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> (<i>E</i>)	<i>U</i> _{rel} (<i>E</i>)
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\text{ 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	$1 \cdot 10^{-6}/\text{K}$

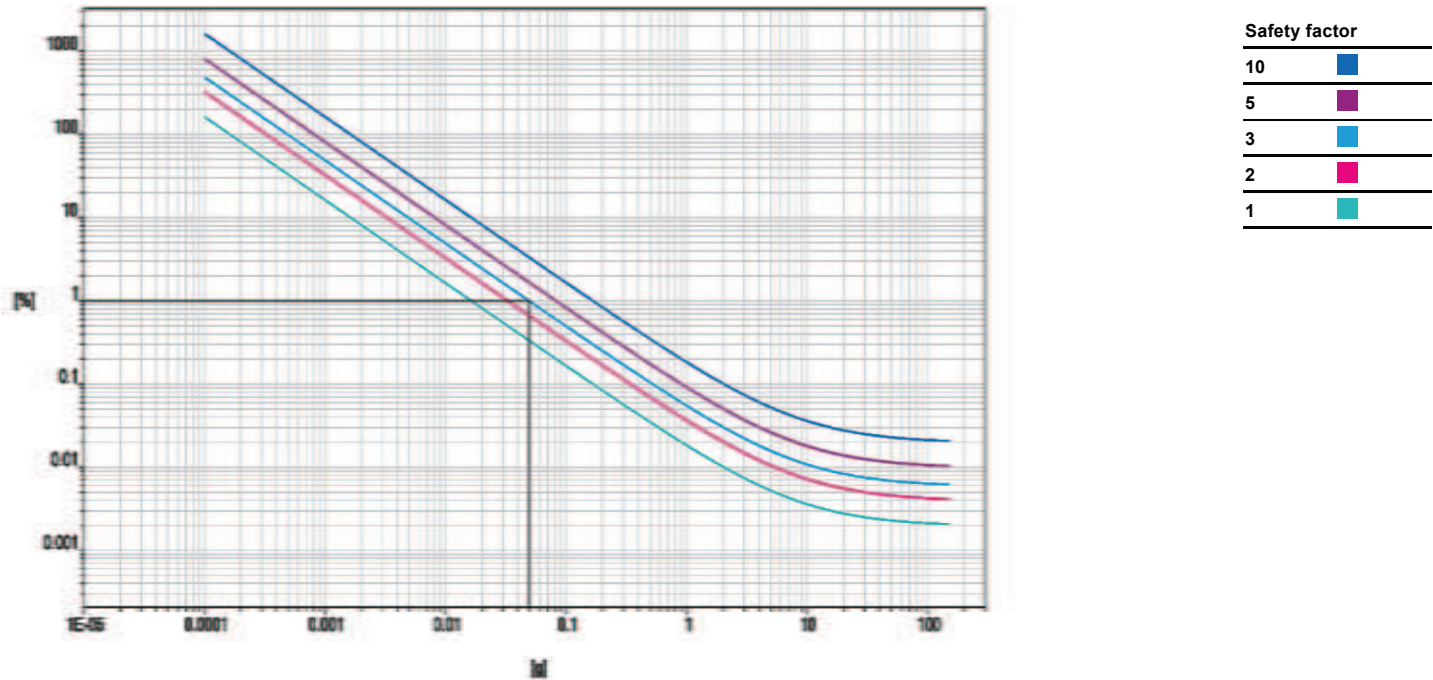
Uncertainty of the weighing result $U_{gl}(W)$

$U_{gl}(W) = 0.00016 \text{ g} + 1.95 \cdot 10^{-5} \cdot R$

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

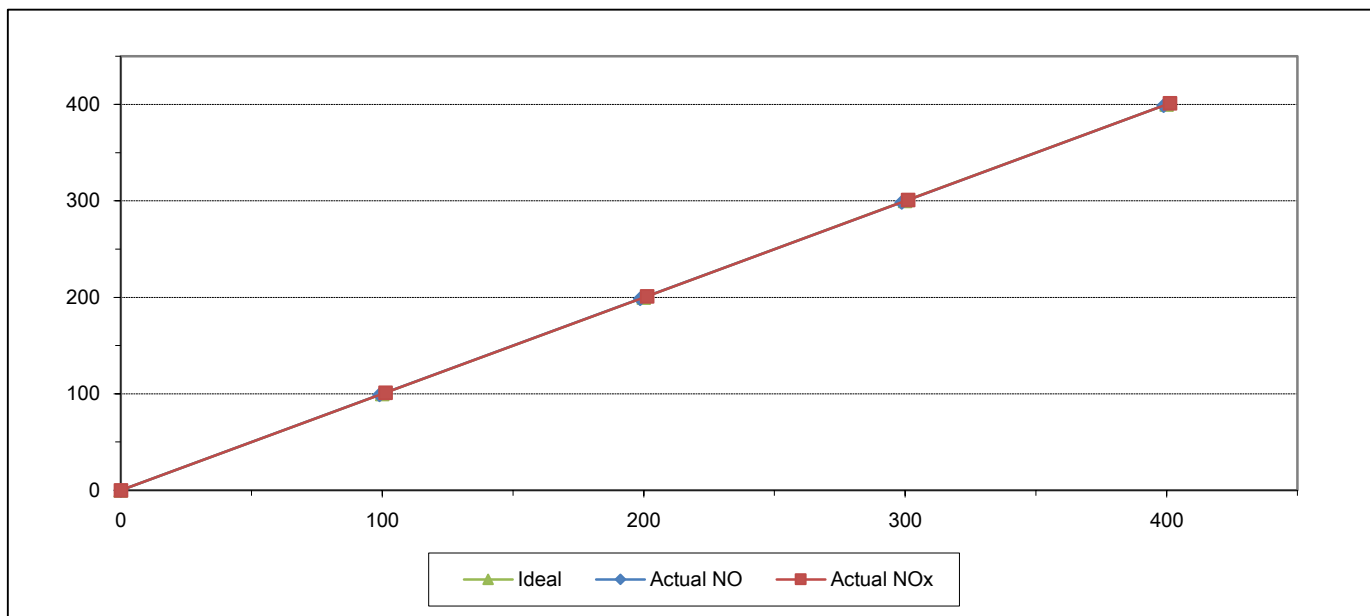


MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-26
Manufacturer Teledyne API
Serial No. 107
Calibrator Manufacturer Teledyne API
Serial No. 947
Std. Gas Concentration (PPM) 55.88
Cylinder Pressure (psi) 1800
Certified Date 9-Feb-22

Equipment Name NOx Analyzer
Model N200
Equipment ID RYG_FS0731
Model 700
Cylinder No. GN0027222
Certified By Airgas Inc.
Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00	101.30	1.30	1.30
2	200.00	198.60	-1.40	-0.70	201.30	1.30	0.65
3	300.00	298.70	-1.30	-0.43	301.10	1.10	0.37
4	400.00	398.80	-1.20	-0.30	401.30	1.30	0.33
AVERAGE (%)				-0.47			0.55



Calibrated By

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

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

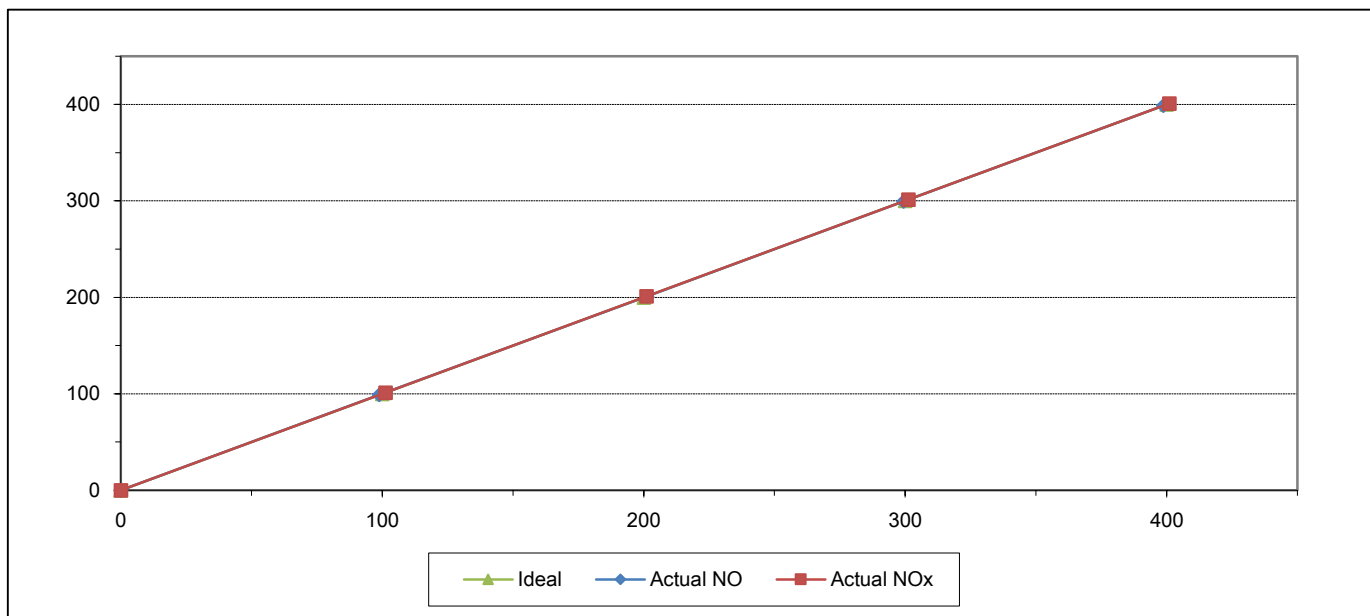


MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-26
Manufacturer HORIBA
Serial No. R06K0177
Calibrator Manufacturer Teledyne API
Serial No. 947
Std. Gas Concentration (PPM) 55.88
Cylinder Pressure (psi) 1800
Certified Date 9-Feb-22

Equipment Name NOx Analyzer
Model APNA-370
Equipment ID RYG_FS0463
Model 700
Cylinder No. GN0027222
Certified By Airgas Inc.
Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.90	-1.10	-1.10	101.30	1.30	1.30
2	200.00	201.30	1.30	0.65	201.10	1.10	0.55
3	300.00	299.40	-0.60	-0.20	301.30	1.30	0.43
4	400.00	398.70	-1.30	-0.33	401.10	1.10	0.28
AVERAGE (%)				-0.18			0.53



Calibrated By

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

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

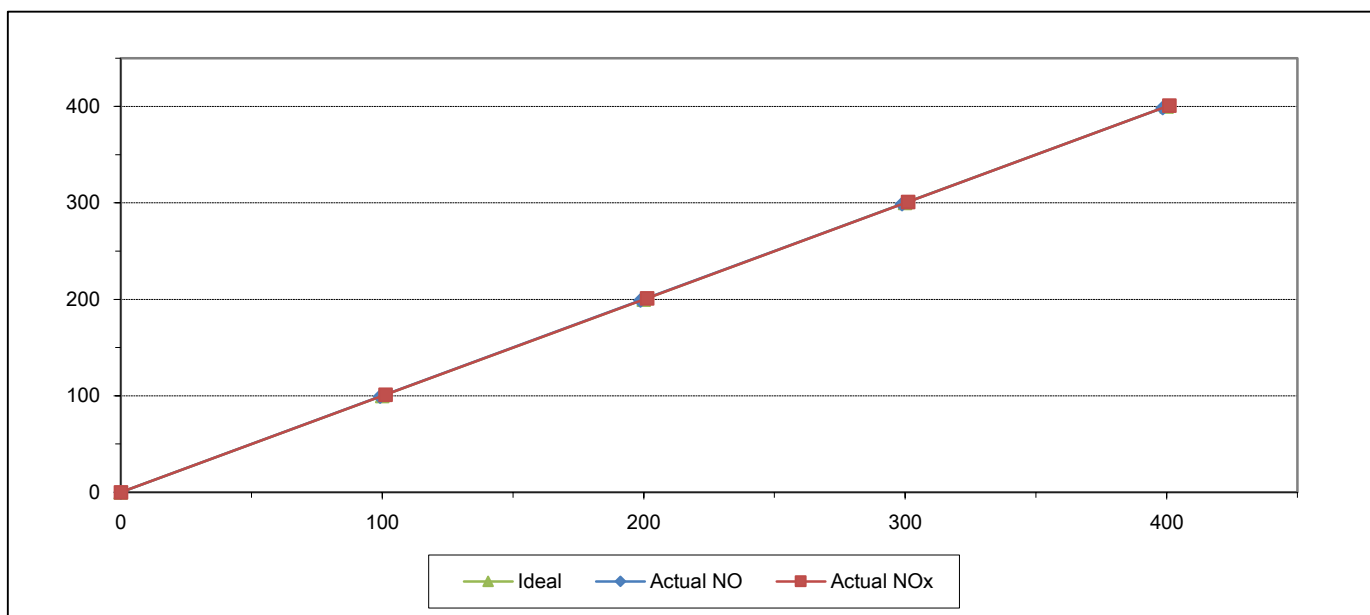


MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-26
Manufacturer Teledyne API
Serial No. 122
Calibrator Manufacturer Teledyne API
Serial No. 947
Std. Gas Concentration (PPM) 55.88
Cylinder Pressure (psi) 1800
Certified Date 9-Feb-22

Equipment Name NOx Analyzer
Model N200
Equipment ID RYG_FS0732
Model 700
Cylinder No. GN0027222
Certified By Airgas Inc.
Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	101.30	1.30	1.30
2	200.00	198.80	-1.20	-0.60	201.30	1.30	0.65
3	300.00	298.80	-1.20	-0.40	301.10	1.10	0.37
4	400.00	398.50	-1.50	-0.38	401.00	1.00	0.25
AVERAGE (%)				-0.41			0.53



Calibrated By

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

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager



Certificate of Calibration

Customer

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

Certificate No : 25-AFM-208

Request No : Req-2025-1986

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mesa Labs
Model : 200-510M
Serial Number : 151114
ID : BKK_FS0614
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 3 September 2025
Calibration Date : 10 September 2025
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

REVIEW BY	<i>Wanlan P.</i>
APPROVED BY	<i>[Signature]</i>
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	Qreborn	15 October 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

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

Note :

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

Calibration By :

[Signature]

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

[Signature]

Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 10 September 2025



Certificate No : 25-AFM-208

Request No : Req-2025-1986

Result of Calibration : Without Adjustment

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

Note

STD : Standard UUC : Unit Under Calibration

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

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

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

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

meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 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
Model : 200-510L
Serial Number : 130026
ID : BKK_FS0619
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 3 September 2025
Calibration Date : 10 September 2025
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

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	Qreborn	15 October 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

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

Note :

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

Calibration By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 10 September 2025

Certificate No : 25-AFM-207

Request No : Req-2025-1987

Result of Calibration : Without Adjustment

STD Reading			UUC Readingg			Error (cc/min)	Uncertainty		
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)		(cc/min)	(°C)	(kPa)
25.5	100.98	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	3.6	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	301	-	-	300.05	-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 :

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

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

* Indicates non accredited

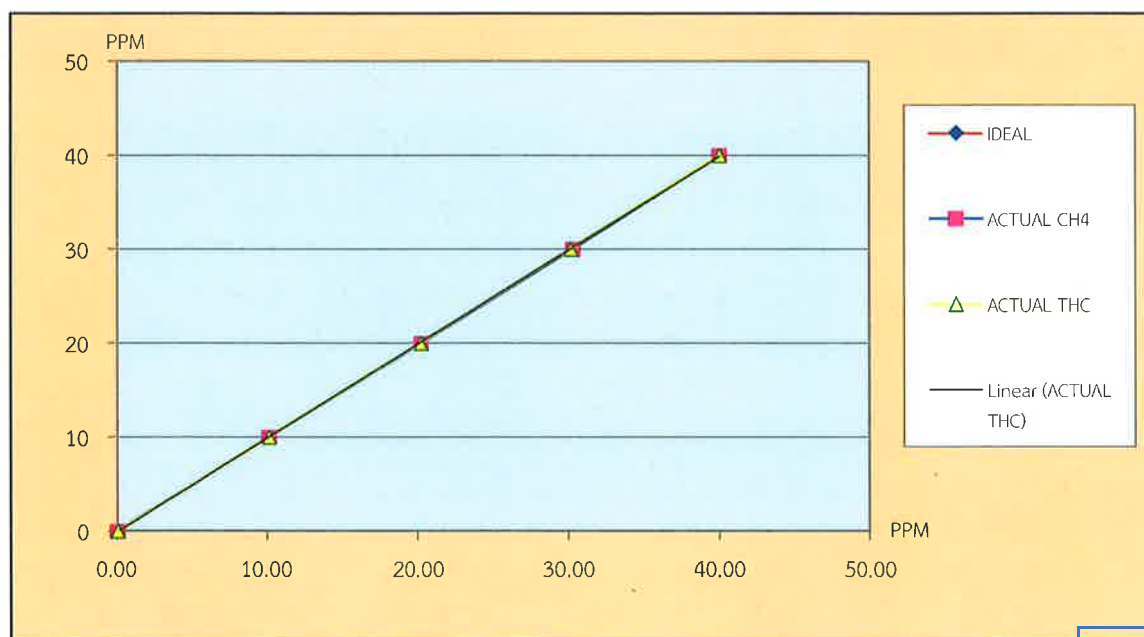
End of Certificate

TEST REPORT

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		
STANDARD GAS CONCENTRATION (PPM) (CH ₄)	: 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		

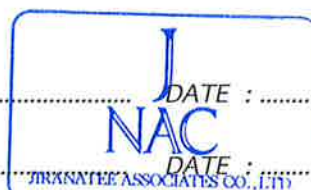
TEST RESULTS

POINT NO	TEST RESULTS						
	IDEAL	ACTUAL CH ₄	ERROR CH ₄	%ERROR CH ₄	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 : กัทสิน มุกติม

CHECKED BY : ศิษย์ ธิมา



REVIEW BY Supt. S.

APPROVED BY

NEXT CAL DATE : 14/ 01/ 2027

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

เลขที่ 63/14-15,67/35-36 ถนนเพชรเกษม 7,7/1 แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-8680812-13 โทรสาร 02-868-1889

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°Cto15°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 430 °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	245.30	244.20
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 #81

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

อาการที่ตรวจพบ

- Maintenance

รายละเอียดการดำเนินการ

- ทำ Calibration Zero/Span , Multipoint

ผลการดำเนินการ

- เรียบร้อย เครื่องสามารถดำเนินการตรวจวัดได้ตามปกติ

CALIBRATED BY :
CHECKED BY :



DATE : 18/11/67
DATE : 15/11/67

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jirantee.com
เลขที่ 63/14-15,67/35-36 ซอยเพชรเกษม 7,7/1 ถนนเพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Air speed measurement laboratory
Calibration services department.



NSC – TISI – TIS 17025
CALIBRATION 0367

Certificate Number

CWS-010-69

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-A5910
Data logger: A5910
ID NUMBER : RYG_FS0609
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 : 09 Jan 2026
MEASUREMENT DATE : 21 Jan 2026
ISSUE DATE : 21 Jan 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 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, (53.1) %RH and (1013.3) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol



Approved signatory: _____

Mr. Parinya Booncharoen
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 close 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 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: Supt S

APPROVED BY: [Signature]

NEXT CAL DATE: 20/ 07/ 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 ² to ¹

MEASUREMENT RESULTS⁵

The Cup anemometer, Unit Under Calibration (UUC) was exercised 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.

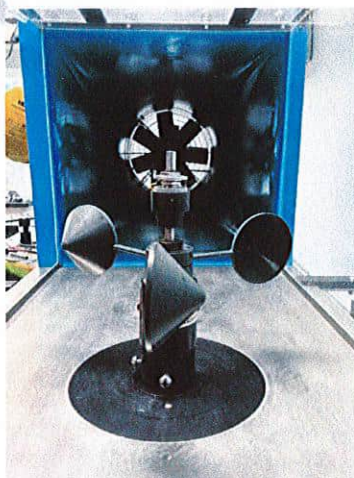
V_{std} ⁶ (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V_{UUC} ⁷ (m/s)	Error (m/s)	$U (k=2)$ (m/s)
0.982	23.40	23.40	0.8	-0.2	0.31
2.123	23.30	23.40	1.9	-0.2	0.31
3.013	23.28	23.40	2.9	-0.1	0.31
4.219	23.30	23.40	3.9	-0.3	0.31
4.96	23.16	23.40	4.9	-0.1	0.31
6.02	23.42	23.40	5.9	-0.1	0.31
6.96	22.98	23.40	7.0	0.0	0.31
7.97	23.42	23.40	8.0	0.0	0.31
8.96	22.82	23.40	9.0	0.0	0.31
9.96	23.36	23.40	10.0	0.1	0.31
10.96	22.98	23.40	11.1	0.1	0.31
12.01	23.40	23.40	12.2	0.2	0.31
13.01	23.00	23.40	13.4	0.4	0.32
14.01	23.30	23.40	14.4	0.4	0.31
15.00	23.10	23.40	15.4	0.4	0.31
15.99	23.28	23.40	16.5	0.5	0.32

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.





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
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-010-69

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD- A5910
Data logger: A5910
ID NUMBER : RYG_FS0609
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 : 09 Jan 2026
MEASUREMENT DATE : 21 Jan 2026
ISSUE DATE : 21 Jan 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	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 (23.5)°C, (59.9) %RH and (1012.4) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
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 ² to ¹

MEASUREMENT RESULTS⁵

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	0.000	0	0	0.60
	45.000	43	-2	0.60
	90.000	86	-4	0.60
	135.000	130	-5	0.93
	180.000	174	-6	0.60
	225.000	220	-5	0.82
	270.000	271	1	0.60
	315.000	321	6	0.60

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.

Jiranatee Associates Co.,Ltd.
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Temperature measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : CDT-030-69

Page 1 of 2 Pages

MEASUREMENT ITEM : Data Logger with Temperature sensor
MANUFACTURER : Novalynx
MODEL/TYPE : 110-WS-25DL-D
SERIAL NUMBER : A5910
ID NUMBER : RYG_FS0609
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.

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-1013-25, Certificate number: ER-0061-25.

Reference Used During Calibration:

1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09,
Due date: 9 Apr 2026
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 22 Apr 2026

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'

RECEIVED DATE : 09 Jan 2026
MEASUREMENT DATE : 21 Jan 2026
ISSUE DATE : 21 Jan 2026

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.

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number CDT-030-69

Page 2 of 2 Pages

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: U3641223.
Dimension: Diameter 12 mm. Length 80 mm.

<u>Immersion Depth</u> (mm)	<u>Standard Reading</u> (°C)	<u>UUC Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (°C)
80	20.046	19.7	-0.3	0.099
80	25.031	24.6	-0.4	0.099
80	30.027	29.7	-0.3	0.099
80	35.031	34.7	-0.3	0.099
80	40.001	39.7	-0.3	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO.,LTD.

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

Relative humidity and Air Temperature measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : CRT-006-69

Page 1 of 2 Pages

MEASUREMENT ITEM : Relative humidity with data logger
MANUFACTURER : Novalynx
MODEL/TYPE : Data Logger: 110-WS-25DL-D
Sensor: HMP60
SERIAL NUMBER : Data Logger: A5910
Sensor: U3641223
ID NUMBER : RYG_FS0609
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 : 09 Jan 2026
MEASUREMENT DATE : 21 Jan 2026
ISSUE DATE : 21 Jan 2026

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'

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.

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number: CRT-006-69

Page 2 of 2 Pages

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

<u>Air Temperature</u> (°C)	<u>Standard Reading</u> (%RH)	<u>UUC Reading</u> (%RH)	<u>Error</u> (%RH)	<u>Uncertainty</u> ± (%RH)
30.09	19.94	21.0	1.1	0.78
30.11	49.98	50.9	0.9	1.3
30.11	79.96	79.9	-0.1	2.1

UUC*: Unit Under Calibration

End of Certificate of Calibration





Lot No. 2610833-1

ANALYZER CALIBRATION DATA

Client : THAI MMA Co., Ltd. Location : ปล่อง Z-6210
Date : 05 Mar 26 Test Operator : Naratip T.

O₂ ANALYZER

Model : TELEDYNE API 200EH Serial No. : 774
Span (%) : 25

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.02	0.04	0.08
Low-Level Gas	8.36	8.37	8.38	0.04
Span Gas	16.02	16.01	16.00	0.04

NO_x ANALYZER

Model : TELEDYNE API 200EH Serial No. : 774
Span (ppm) : 100

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.03	0.04	0.01
Low-Level Gas	56.17	56.17	56.15	0.02
Span Gas	81.09	81.02	81.01	0.01

Calibrated by

Naratip Thueakchaikam

RYG Field Services Scientist (1)

Lot No. 2610833-1**SYSTEM CALIBRATION BIAS AND DRIFT DATA**

Client : THAI MMA Co., Ltd. Location : ปล่อง Z-6210
Date : 05 Mar 26 Test Operator : Naratip T.

O₂ ANALYZERCylinder Conc. (%) : 16.02 Span (%) : 25

	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.02	0.05	0.12	0.05	0.12	0.00
Upscale Gas	16.01	16.00	0.04	16.00	0.04	0.00

NO_x ANALYZERCylinder Conc. (ppm) : 81.09 Span (ppm) : 100

	NO _x Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.03	0.05	0.02	0.05	0.02	0.00
Upscale Gas	81.02	81.00	0.02	81.00	0.02	0.00

Calibrated by

Naratip T.

Naratip Thueakchaikam

RYG Field Services Scientist (1)



EMISSION TEST RESULT

Client	THAI MMA Co., Ltd.	Run #	1
Date	05 Mar 26	Location	ปล่อง Z-6210
Start Time	12:00	Test Operator	Naratip T.
SO ₂ Analyzer Model	-	Finish Time	12:20
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	-
CO/CO ₂ Analyzer Model	-	Serial No.	774
		Serial No.	-

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:00	5.22	8.10	13.56	-	-	
12:01	5.21	8.14	13.52	-	-	
12:02	5.15	8.13	13.50	-	-	
12:03	5.13	8.19	13.53	-	-	
12:04	5.11	8.14	13.60	-	-	
12:05	5.09	8.14	13.63	-	-	
12:06	5.10	8.22	13.69	-	-	
12:07	5.17	8.15	13.68	-	-	
12:08	5.26	8.18	13.62	-	-	
12:09	5.28	8.15	13.57	-	-	
12:10	5.26	8.14	13.63	-	-	
12:11	5.20	8.16	13.67	-	-	
12:12	5.15	8.30	13.65	-	-	
12:13	5.06	8.17	13.65	-	-	
12:14	5.01	8.26	13.70	-	-	
12:15	5.00	8.21	13.75	-	-	
12:16	5.07	8.17	13.78	-	-	
12:17	5.15	8.22	13.75	-	-	
12:18	5.15	8.18	13.64	-	-	
12:19	5.12	8.22	13.63	-	-	
12:20	5.11	8.22	13.67	-	-	
Average	5.15	8.18	13.64	-	-	

Naratip T.

Naratip Thueakchaikam
RYG Field Services Scientist (1)



EMISSION TEST RESULT

Client	THAI MMA Co., Ltd.	Run #	2
Date	05 Mar 26	Location	ปล่อง Z-6210
Start Time	12:21	Test Operator	Naratip T.
SO ₂ Analyzer Model	-	Finish Time	12:41
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	-
CO/CO ₂ Analyzer Model	-	Serial No.	774
		Serial No.	-

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:21	5.15	8.21	13.74	-	-	
12:22	5.17	8.18	13.72	-	-	
12:23	5.19	8.13	13.66	-	-	
12:24	5.22	8.11	13.57	-	-	
12:25	5.23	8.21	13.43	-	-	
12:26	5.21	8.23	13.28	-	-	
12:27	5.15	8.25	13.21	-	-	
12:28	5.07	8.23	13.23	-	-	
12:29	5.00	8.28	13.30	-	-	
12:30	4.94	8.25	13.33	-	-	
12:31	4.97	8.20	13.36	-	-	
12:32	5.05	8.16	13.43	-	-	
12:33	5.12	8.17	13.55	-	-	
12:34	5.15	8.26	13.75	-	-	
12:35	5.20	8.11	13.86	-	-	
12:36	5.21	8.22	13.89	-	-	
12:37	5.17	8.23	13.87	-	-	
12:38	5.13	8.26	13.87	-	-	
12:39	5.14	8.10	13.89	-	-	
12:40	5.13	8.22	13.90	-	-	
12:41	5.13	8.25	13.92	-	-	
Average	5.13	8.20	13.61	-	-	

Naratip T.

Naratip Thueakchaikam
RYG Field Services Scientist (1)



EMISSION TEST RESULT

Client	THAI MMA Co., Ltd.
Date	05 Mar 26
Start Time	12:42
SO ₂ Analyzer Model	-
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH
CO/CO ₂ Analyzer Model	-

Run #	3
Location	ปล่อง Z-6210
Test Operator	Naratip T.
Finish Time	13:02
Serial No.	-
Serial No.	774
Serial No.	-

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
12:42	5.12	8.23	13.98	-	-	
12:43	5.07	8.19	14.01	-	-	
12:44	5.06	8.28	13.94	-	-	
12:45	5.09	8.28	13.88	-	-	
12:46	5.07	8.29	13.93	-	-	
12:47	5.05	8.22	14.04	-	-	
12:48	5.11	8.23	14.12	-	-	
12:49	5.20	8.25	14.14	-	-	
12:50	5.18	8.18	14.11	-	-	
12:51	5.14	8.25	14.01	-	-	
12:52	5.08	8.31	13.86	-	-	
12:53	5.00	8.31	13.84	-	-	
12:54	4.93	8.33	13.89	-	-	
12:55	4.92	8.26	13.92	-	-	
12:56	4.96	8.21	13.86	-	-	
12:57	5.04	8.26	13.81	-	-	
12:58	5.08	8.20	13.84	-	-	
12:59	5.13	8.19	13.83	-	-	
13:00	5.16	8.24	13.87	-	-	
13:01	5.20	8.21	13.89	-	-	
13:02	5.22	8.21	13.91	-	-	
Average	5.09	8.24	13.94	-	-	

Naratip T.

Naratip Thueakchaikam
RYG Field Services Scientist (1)



Lot No. 2610835-1

ANALYZER CALIBRATION DATA

Client : THAI MMA Co., Ltd. Location : ปล่อง 2Z-6210
Date : 06 Mar 26 Test Operator : Naratip T.

O₂ ANALYZER

Model : TELEDYNE API 200EH Serial No. : 774
Span (%) : 25

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.01	0.03	0.08
Low-Level Gas	8.36	8.37	8.37	0.00
Span Gas	16.02	16.02	16.05	0.12

NO_x ANALYZER

Model : TELEDYNE API 200EH Serial No. : 774
Span (ppm) : 100

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.02	0.02
Low-Level Gas	56.17	56.18	56.20	0.02
Span Gas	81.09	81.09	81.11	0.02

Calibrated by

Naratip Thueakchaikam

RYG Field Services Scientist (1)

Lot No. 2610835-1**SYSTEM CALIBRATION BIAS AND DRIFT DATA**

Client : THAI MMA Co., Ltd. Location : ปล่อง 2Z-6210
Date : 06 Mar 26 Test Operator : Naratip T.

O₂ ANALYZERCylinder Conc. (%) : 16.02 Span (%) : 25

	O ₂ Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.01	0.03	0.08	0.03	0.08	0.00
Upscale Gas	16.02	16.00	0.08	16.00	0.08	0.00

NO_x ANALYZERCylinder Conc. (ppm) : 81.09 Span (ppm) : 100

	NO _x Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.00	0.04	0.04	0.05	0.05	0.01
Upscale Gas	81.09	81.10	0.01	81.10	0.01	0.00

Calibrated by

Naratip T.

Naratip Thueakchaikam

RYG Field Services Scientist (1)



EMISSION TEST RESULT

Client	THAI MMA Co., Ltd.	Run #	1
Date	06 Mar 26	Location	ปล่อย 22-6210
Start Time	10:30	Test Operator	Naratip T.
SO ₂ Analyzer Model	-	Finish Time	10:50
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	-
CO/CO ₂ Analyzer Model	-	Serial No.	774
		Serial No.	-

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:30	5.34	8.37	10.71	-	-	
10:31	5.21	8.35	10.66	-	-	
10:32	5.13	8.35	10.63	-	-	
10:33	5.15	8.23	10.61	-	-	
10:34	5.37	8.30	10.57	-	-	
10:35	5.41	8.28	10.57	-	-	
10:36	5.29	8.38	10.54	-	-	
10:37	5.20	8.29	10.59	-	-	
10:38	5.17	8.18	10.61	-	-	
10:39	5.35	8.19	10.64	-	-	
10:40	5.43	8.27	10.65	-	-	
10:41	5.30	8.33	10.67	-	-	
10:42	5.19	8.31	10.67	-	-	
10:43	5.15	8.26	10.66	-	-	
10:44	5.21	8.27	10.69	-	-	
10:45	5.40	8.24	10.71	-	-	
10:46	5.36	8.32	10.70	-	-	
10:47	5.21	8.35	10.71	-	-	
10:48	5.13	8.27	10.76	-	-	
10:49	5.12	8.24	10.77	-	-	
10:50	5.31	8.25	10.74	-	-	
Average	5.25	8.29	10.66	-	-	

Naratip T.

Naratip Thueakchaikam
RYG Field Services Scientist (1)



EMISSION TEST RESULT

Client	THAI MMA Co., Ltd.	Run #	2
Date	06 Mar 26	Location	ปล่อง 22-6210
Start Time	10:51	Test Operator	Naratip T.
SO ₂ Analyzer Model	-	Finish Time	11:11
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH	Serial No.	-
CO/CO ₂ Analyzer Model	-	Serial No.	774
		Serial No.	-

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
10:51	5.37	8.35	10.71	-	-	
10:52	5.24	8.33	10.74	-	-	
10:53	5.12	8.31	10.78	-	-	
10:54	5.12	8.19	10.77	-	-	
10:55	5.35	8.35	10.76	-	-	
10:56	5.35	8.45	10.76	-	-	
10:57	5.19	8.32	10.79	-	-	
10:58	5.08	8.36	10.78	-	-	
10:59	5.10	8.18	10.77	-	-	
11:00	5.33	8.24	10.71	-	-	
11:01	5.35	8.37	10.72	-	-	
11:02	5.19	8.38	10.76	-	-	
11:03	5.10	8.33	10.82	-	-	
11:04	5.13	8.23	10.83	-	-	
11:05	5.36	8.30	10.80	-	-	
11:06	5.34	8.39	10.75	-	-	
11:07	5.17	8.38	10.79	-	-	
11:08	5.08	8.36	10.81	-	-	
11:09	5.07	8.22	10.85	-	-	
11:10	5.29	8.32	10.86	-	-	
11:11	5.34	8.27	10.84	-	-	
Average	5.22	8.31	10.78	-	-	

Naratip T.

Naratip Thueakchaikam
RYG Field Services Scientist (1)



EMISSION TEST RESULT

Client	THAI MMA Co., Ltd.
Date	06 Mar 26
Start Time	11:12
SO ₂ Analyzer Model	-
NO _x /O ₂ Analyzer Model	TELEDYNE API 200EH
CO/CO ₂ Analyzer Model	-

Run #	3
Location	ปล่อง 2Z-6210
Test Operator	Naratip T.
Finish Time	11:32
Serial No.	-
Serial No.	774
Serial No.	-

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:12	5.19	8.42	10.87	-	-	
11:13	5.08	8.31	10.90	-	-	
11:14	5.08	8.23	10.90	-	-	
11:15	5.21	8.25	10.88	-	-	
11:16	5.34	8.35	10.88	-	-	
11:17	5.21	8.43	10.91	-	-	
11:18	5.09	8.36	10.92	-	-	
11:19	5.07	8.19	10.91	-	-	
11:20	5.27	8.34	10.93	-	-	
11:21	5.36	8.36	10.96	-	-	
11:22	5.23	8.35	10.99	-	-	
11:23	5.11	8.35	10.98	-	-	
11:24	5.13	8.31	10.95	-	-	
11:25	5.34	8.29	10.92	-	-	
11:26	5.37	8.34	10.90	-	-	
11:27	5.20	8.41	10.90	-	-	
11:28	5.04	8.40	10.96	-	-	
11:29	5.07	8.31	10.97	-	-	
11:30	5.30	8.33	10.94	-	-	
11:31	5.28	8.41	10.93	-	-	
11:32	5.13	8.42	10.99	-	-	
Average	5.19	8.34	10.93	-	-	

Naratip T.

Naratip Thueakchaikam
RYG Field Services Scientist (1)

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer:	AIR LIQUIDE (THAILAND) LTD	Reference Number:	160-402885482-1
Part Number:	E04NI99E3HA0002	Cylinder Volume:	247.0 CF
Cylinder Number:	GN0029492	Cylinder Pressure:	2215 PSIG
Laboratory:	124 - Plumsteadville - PA	Valve Outlet:	660
PGVP Number:	A12023	Certification Date:	Nov 21, 2023
Gas Code:	CO,NO,NOX,SO2,BALN		

Expiration Date: Nov 21, 2031

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

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	80.00 PPM	81.09 PPM	G1	+/- 0.7% NIST Traceable	11/14/2023, 11/21/2023
CARBON MONOXIDE	80.00 PPM	80.48 PPM	G1	+/- 0.5% NIST Traceable	11/14/2023
NITRIC OXIDE	80.00 PPM	80.97 PPM	G1	+/- 0.7% NIST Traceable	11/14/2023, 11/21/2023
SULFUR DIOXIDE	80.00 PPM	79.92 PPM	G1	+/- 0.8% NIST Traceable	11/14/2023, 11/21/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	110101-08	KAL003090	97.31 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	May 25, 2028
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2025
GMIS	2023042502	CC754074	98.48 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	May 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMIS	401648675101	CC500133	4.981 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003820	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO	FTIR	Nov 09, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Nov 16, 2023
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Nov 02, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Oct 26, 2023

Triad Data Available Upon Request

NOTES: Gross Weight: 48.4 Kg

Net Weight: 8.1 Kg



[Signature]
Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E3HA0066	Reference Number:	160-402138464-1
Cylinder Number:	ND11223	Cylinder Volume:	247.2 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2215 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Jul 15, 2021

Expiration Date: Jul 15, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	55.00 PPM	56.17 PPM	G1	+/- 1.4% NIST Traceable	07/08/2021, 07/15/2021
CARBON MONOXIDE	55.00 PPM	54.24 PPM	G1	+/- 0.5% NIST Traceable	07/08/2021
NITRIC OXIDE	55.00 PPM	56.17 PPM	G1	+/- 1.0% NIST Traceable	07/08/2021, 07/15/2021
SULFUR DIOXIDE	55.00 PPM	55.51 PPM	G1	+/- 1.1% NIST Traceable	07/08/2021, 07/15/2021
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	11010130	KAL004536	97.31 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	Oct 04, 2022
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
NTRM	200610-50	CC733426	98.61 PPM NITRIC OXIDE/NITROGEN	+/- 0.9%	Oct 06, 2026
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010224	KAL003838	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021

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

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2010245 CO	FTIR	Jun 24, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jul 01, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 30, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jul 09, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 47.9 Kg
Net Weight: 7.8 Kg



Michael A. Fisher
Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE
(THAILAND) LTD
Part Number: E02NI92E3HA0000
Cylinder Number: GN0032751
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12024
Gas Code: O2,BALN

Reference Number: 160-403186613-1
Cylinder Volume: 248.0 CF
Cylinder Pressure: 2214 PSIG
Valve Outlet: 590
Certification Date: Nov 12, 2024

Expiration Date: Nov 12, 2032

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	8,000 %	8.054 %	G1	+/- 0.3% NIST Traceable	11/12/2024
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	060602	CC263047	9.96 % OXYGEN/NITROGEN	+/-0.3%	Jun 27, 2030

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS OXYMAT 6 - N1-W5-951 - O2	PARAMAGNETIC	Oct 30, 2024

Triad Data Available Upon Request

NOTES: Gross Weight: 48.3 Kg
Net Weight: 8.2 Kg



[Signature]

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE
(THAILAND) LTD
Part Number: E02NI84E3HA0001
Cylinder Number: GN0027197
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12022
Gas Code: O2,BALN
Reference Number: 160-402340010-1
Cylinder Volume: 249.8 CF
Cylinder Pressure: 2214 PSIG
Valve Outlet: 590
Certification Date: Feb 02, 2022

Expiration Date: Feb 02, 2030

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	16.00 %	16.02 %	G1	+/- 0.4% NIST Traceable	02/02/2022
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	08010230	K005228	23.20 % OXYGEN/NITROGEN	+/- 0.4%	Jun 01, 2022

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS OXYMAT 6 - N1-W5-951 - O2	PARAMAGNETIC	Jan 27, 2022

Triad Data Available Upon Request

NOTES: Gross Weight: 48.8 Kg

Net Weight: 8.2 Kg




Approved for Release



CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date **6-Jan-26**
 Next Calibration Date **06-Jul-26**
 Certificate No. **C-060126-BKK_FS0556**

Barometric Pressure (mm.Hg) : **756.1**
 Relative Humidity (%) : **46.5**
 Temperature (°C) : **27.0**

Console Control Meter Data

Dry Gas Meter ID **BKK_FS0556**
 Brand APEX INSTRUMENT
 Serial No. 1606041
 Model No. XC-572-V

Reference Dry Gas Meter Data

Reference Dry Gas Meter ID : **BKK_FS1122**
 Serial No. : A2003240
 Correction Factor (Y) : 1.000
 Next Calibration Date : 26-Feb-26

ΔH (mm.H ₂ O)	$\ominus$ Minutes	Reference Dry Gas Meter Calibration				Console Control ; Drygas Meter						Dry Gas Meter	Orifice
		Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg.Tm (°C)	Correction	Calibration
		Final	Initial	Total		Final	Initial	Total				Factor (Y)	Factor $\Delta H@$
15	11.90	150.03	0.00	150.03	30.0	707296.8	707153.0	143.80	28.0	28.0	28.0	1.0349	43.8195
25	9.25	150.12	0.00	150.12	29.0	707448.8	707304.0	144.80	28.0	28.0	28.0	1.0308	43.7838
50	6.60	150.10	0.00	150.10	28.0	707599.4	707454.0	145.40	28.0	28.0	28.0	1.0273	44.2943
100	4.67	150.40	0.00	150.40	27.0	707752.0	707606.2	145.80	28.0	28.0	28.0	1.0250	43.8844
150	3.80	150.11	0.00	150.11	25.0	707904.8	707759.2	145.60	28.0	28.0	28.0	1.0264	43.1725
											Avg.	1.0289	43.7909

Y : Ratio of reading of reference to dry gas meter : tolerance for individual values $\pm$ 0.02 from average .

$\Delta H@$: Orifice pressure differential that equates to 21.24 lm of air @ 25 C and 760 mm of mercury , mmH₂O ; tolerance for individual values $\pm$ 5.08 from average .

Procedure; 40 CFR 60,APP A,METH ,SEC 5.3 & 7

Calibrated by:

Apisit Singha

(Mr. Apisit Singha)

Field Services Scientist (4)

Approved by:

Natthapon Jiengwareewong

(Mr. Natthapon Jiengwareewong)

Field Services Specialist (1)

Issue date : 07-Jan-26

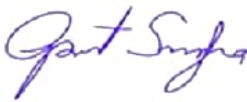


DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	6 Jan 26	Ambient Temperature (°C)	27
Calibration sheet No. :	C-060126-BKK_FS0557	Relative Humidity (%) :	46.5
Digital Temperature ID :	BKK_FS0557	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

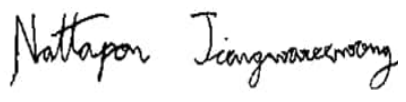
Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	26	1	±3	Pass
	50	50	0	±3	Pass
	100	101	1	±3	Pass
	150	151	1	±3	Pass
	200	200	0	±3	Pass
	250	250	0	±3	Pass
	300	301	1	±3	Pass
	500	501	1	±3	Pass
Probe	100	101	1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Oven	100	101	-2	±3	Pass
	120	121	-3	±3	Pass
	140	141	3	±3	Pass
Filter	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	141	1	±3	Pass
Exit	0	0	0	±3	Pass
	10	11	1	±3	Pass
	20	21	1	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	51	1	±3	Pass
AUX	0	0	0	±3	Pass
	25	26	1	±3	Pass
	50	51	1	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัดที่ยอมรับได้

Calibrated by : 

(Mr.Apisit Sing-ha)

Field Scientist (4)

Approved by : 

Mr.Natthapol Jiengwareewong

Field Specialist (1)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date : 6 Jan 26	Nozzle Set ID. : BKK_FS0562
Calibration Sheet No. : C-060126-BKK_FS0562	Vernier Caliper ID.: BKK_FS0626

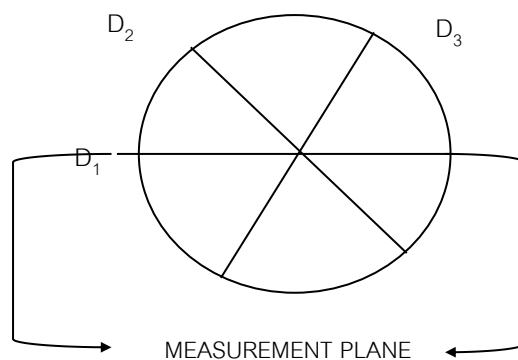
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	$(D_1 + D_2 + D_3) / 3$
	D_1	D_2	D_3	ΔD	D_{avg}
1	0.300	0.300	0.302	0.002	0.301
2	0.475	0.475	0.469	0.006	0.473
3	0.530	0.525	0.530	0.005	0.528
4	0.625	0.628	0.630	0.005	0.628
5	0.759	0.760	0.765	0.006	0.761
6	0.975	0.977	0.980	0.005	0.977
7	1.082	1.085	1.081	0.004	1.083
8	1.272	1.270	1.275	0.005	1.272
9	1.605	1.601	1.609	0.008	1.605

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. Warawut Pubpa)

Field Scientist (3)

Approved by : 

(Mr. Natthapol Jiengwareewong)

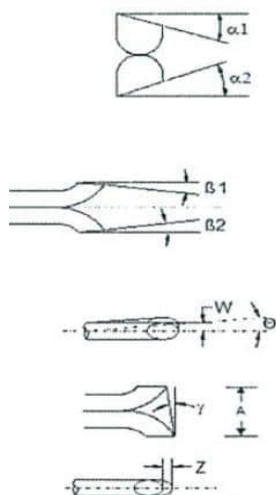
Field Specialist (1)



Type S Pitot Tube Calibration

Date Calibration 6-Jan-26
Pitot ID BKK_FS0560
Pitot SN 1803811

Due Date 6-Jul-26
Inclinometer ID BKK_FS1131
Vernier ID RYG_FS0539



Parameter	Value	Allowable Range	Check
$\alpha 1$	0.4	$-10^\circ < \alpha 1 < +10^\circ$	OK
$\alpha 2$	1.6	$-10^\circ < \alpha 2 < +10^\circ$	OK
$\beta 1$	1.7	$-5^\circ < \beta 1 < +5^\circ$	OK
$\beta 2$	0.2	$-5^\circ < \beta 2 < +5^\circ$	OK
γ	2.2	-	-
θ	1.6	-	-
$Z = A \tan \gamma$	0.032	$Z \leq 0.125"$	OK
$W = A \tan \theta$	0.023	$W \leq 0.031"$	OK
Dt	0.300	0.188" to 0.375"	OK
$A/2Dt$	1.373	$1.05 \leq PA/Dt \leq 1.5$	OK
A	0.824	$2.1Dt \leq A \leq 3Dt$	OK

Certify that pitot tube/porbe meets or exceeds all specifications, criteria 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.

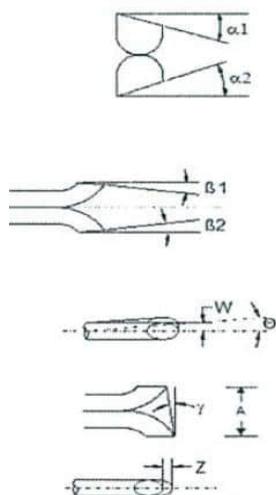
Calibrated by : Saksit Phaisanphisut
 (Mr. Saksit Phaisanphisut)
 RYG Field Services Scientist (4)

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



Type S Pitot Tube Calibration

Date Calibration	6-Jan-26	Due Date	6-Jul-26
Pitot ID	BKK_FS0561	Inclinometer ID	BKK_FS1131
Pitot SN	-	Vernier ID	RYG_FS0539



Parameter	Value	Allowable Range	Check
$\alpha 1$	0.4	$-10^{\circ} < \alpha 1 < +10^{\circ}$	OK
$\alpha 2$	0.2	$-10^{\circ} < \alpha 2 < +10^{\circ}$	OK
$\beta 1$	2	$-5^{\circ} < \beta 1 < +5^{\circ}$	OK
$\beta 2$	2.4	$-5^{\circ} < \beta 2 < +5^{\circ}$	OK
γ	1.4	-	-
θ	1.6	-	-
$Z = A \tan \gamma$	0.020	$Z \leq 0.125"$	OK
$W = A \tan \theta$	0.023	$W \leq 0.031"$	OK
Dt	0.320	0.188" to 0.375"	OK
$A/2Dt$	1.286	$1.05 \leq PA/Dt \leq 1.5$	OK
A	0.823	$2.1Dt \leq A \leq 3Dt$	OK

Certify that pitot tube/porbe meets or exceeds all specifications, criteria 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 : Saksit Phaisanphisut
 (Mr. Saksit Phaisanphisut)
 RYG Field Services Scientist (4)

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

Certificate No: G 250438

Date of issue : 23-Dec-25

Instrument description : Flue Gas Analyzer
Instrument model : Testo 340
Instrument serial no. : 63119028
Control unit serial no. : -
ID no. or control no. : RYG_FS0565
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-254985
Receiving date. : 19-Dec-25
Parameter of calibration : Gas Calibration (Oxygen, Carbon Monoxide, Nitric Oxide, Sulphur Dioxide)
Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
 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

REVIEW BY *Supt S*
 APPROVED BY *[Signature]*
 NEXT CAL DATE. 22/ 12/ 2026

*The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement 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 : 23-Dec-25

[Signature]

Mr. Kwanchai Khamdoun
Calibration Technician

[Signature]

Mrs. Nongluck Wongsettee
Technical Manager

Certificate No.: G 250438

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.506 % Vol	1287/25	Linde	08-May-29
Oxygen (O ₂) 9.984 % Vol	CG-0090-25	Nimt	24-Jun-30
Oxygen (O ₂) 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
Nitric Oxide (NO) 30.0 ppm	CG-0065-24	Nimt	06-May-26
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 (SO ₂) 50.4 ppm	1306/25	Linde	12-May-27
Sulphur Dioxide (SO ₂) 100.7 ppm	2662/24	Linde	25-Aug-26
Sulphur Dioxide (SO ₂) 605.9 ppm	1229/25	Linde	04-May-27

Measured room conditions

Temperature : 23.2 °C Humidity : 67.7 %RH Pressure : 1011.2 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 700 ml/min Gas pressure : 1015.9 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.506	2.44	-0.066	0.15
O ₂ (%Vol)	9.984	9.88	-0.104	0.20
O ₂ (%Vol)	21.01	21.12	0.11	0.30
CO (ppm)	80.47	81	0.53	3.0
CO (ppm)	300.9	300	-0.9	6.0
CO (ppm)	1000	998	-2	13
NO (ppm)	30.0	30	0.0	8.0
NO (ppm)	151.8	152	0.2	8.0
NO (ppm)	322	321	-1	12
SO ₂ (ppm)	50.4	49	-1.4	6.0
SO ₂ (ppm)	100.7	100	-0.7	6.0
SO ₂ (ppm)	605.9	605	-0.9	13

Remark : 1 cmol/mol = 1 %vol. 1 μmol/mol = 1 ppm, Sensor(CO, NO, SO₂)New.

End of Certificate of Calibration



Certificate of Calibration

Certificate No. C-060126-RYG_FS0106

Air Sampling Pump Detail

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

Equipment ID : RYG_FS0106
Serial No. : 20220731509
Calibration Date : 06-Jan-26
Next calibration date : 06-Apr-26

Reference Standard Low Flow Meter

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

Equipment ID : BKK_FS0619
Serial No. : 130026
Calibration Date : 10-Sep-25
Due Date : 9-Sep-26

Reference Standard High Flow Meter

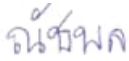
Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

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

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)		Evaluation (Pass/ Fail)	
	1	2	3						
Low Flow									
20	20.6	20.5	20.7	20.6	5%	19	-	21	Passed
50	50.3	50.5	50.3	50.4	5%	48	-	53	Passed
100	103.0	103.2	103.2	103.1	5%	95	-	105	Passed
200	203.1	201.8	202.1	202.3	5%	190	-	210	Passed
High Flow									
500	499.6	499.9	499.7	499.7	3%	485	-	515	Passed
1000	1005.6	1007.2	1009.8	1007.5	3%	970	-	1030	Passed
2000	2005.5	2002.7	2003.8	2004.0	3%	1940	-	2060	Passed
2500	2504.4	2499.6	2503.8	2502.6	3%	2425	-	2575	Passed

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

Calibrated By: 

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 07-Jan-26

Approved By: 

(Mr. Supot Salamteh)

Field Services Section Head



ARCHEMICA

REVIEW BY Ponty Bani

APPROVED BY S. Cha

NEXT CAL DATE 6-Jan-27

Certificate of Calibration

HPLC_U-3000 ID#690 (BKK_FL0034)

This certificate is to verify that instrument below are calibrated
by *Archemica Lab Co., Ltd.*

DGP-3600SD S/N : 8105093

WPS-3000TSL S/N : 8107446

TCC-3000SD S/N : 6006552

DAD-3000 S/N : 8107298

For

ALS Laboratory Group (Thailand) Co., Ltd.



Operator Signature: _____

Date: 6-7/Jan/2026

(Mr. Nutitep Moungon)

Application Chemist

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-12
Organization Name: ALS Laboratory Groups (Thailand) Co Ltd.
Organization Location: 104 Phattanakan 40 Phattanakan Rd Bangkok 10250

Date: May 9, 2025 3:29:14 PM
EQP Name: AgilentRecommended , AgilentRecommended

EQP Revision: GC.02.53, GCMS.02.54
Overall Qualification Status: Pass

REVIEW BY Suchada T.
APPROVED BY Tomyntorn M.
NEXT CAL. DATE 9 May 26.

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 8890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 8890
Front SSL

Setpoint Status: Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	24.8	psi
Accuracy:			0.2	psi
Agilent Recommended:			<= 1.2	

Date: May 9, 2025 3:29:14 PM
System ID: GM-12

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 8890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.1 °C

Accuracy: 0.1 °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: 100.0 100.1 °C

Accuracy: 0.1 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-3.7 °C) ≤ 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 8890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.1167 °C

Stability: 0.1 °C

Agilent Recommended: ≤ 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977C			
Setpoint Status:	Pass			
Overall Log Amp Test Status				
Pass				

RFPA

Tested Combination1	Front	SSL	/ External	SQ			
Name:	5977C						
Setpoint Status:	Pass						
Amu:	1050	m/z	Drift After Five Minutes:	RFPA Voltage:			
			1	497			
			mV	mV			
Agilent Recommended:	>=	-100	and	<=	100	<=	1100
Overall RFPA Test Status							
Pass							

Tune EI

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977C			
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 - Extractor			
Setpoint Status:	Completed			
Injection Volume on Column:	1.0 uL			
Overall Scouting Run Status	Completed			

Instrument Detection Limit

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0 uL			
	Area		Retention Time	
Minimum RSD:	1.27 %		0.01 %	
Agilent Recommended:	<= 5.00		<= 1.00	
Status:	Pass		Pass	
Instrument Detection Limit:	4.28135 fg			
Agilent Recommended:	<= 16.82500			
Status:	Pass			

Overall Instrument Detection Limit Test Status

Pass

Mass Ratio Precision

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0	uL		
	Area Mass 1		Mass Ratio	
	Abundance*s			
RSD:	2.17	%	0.50	%
Agilent Recommended:	<= 5.00		<= 5.00	
	Pass		Pass	

Overall Mass Ratio Precision Test Status

Pass

NOTE: This test's 1 comment(s) and 0 deviation(s) are available in the Attachments section.

Instrument Details

Purpose

This section describes the as found system configuration.

Details

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	CN23125102
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10
Sampler 2	
Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN23147049
Firmware Revision	A.12.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A031
Firmware Revision	2.8.1.6
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977C
Model Number	G7077C
Serial Number	US2307MA35
Firmware Revision	6.00.35
Rough Pump	Wet Mechanical Vacuum Pump
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

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:	Phuwanai Yoktragul
Logged On User Name:	phuwanai.yoktragul@agilent.com
Signature Creation Date:	May 9, 2025
Reason for Signature:	Executed protocol and published this original version of document

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

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.yokdragul
Report Generated by Hostname: SCG9217CJG

System ID: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:38:52 PM	Audit	SessionCreated	Session	Host Name: SCG9217CJG, Drive Serial Number: BC4P1A4T
May 8, 2025 2:38:52 PM	start	Configuration	Session	None
May 8, 2025 2:38:52 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
May 8, 2025 2:41:01 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurat ions/02.53/Gc.02.53.esq], EQP File Name: [Gc.02.53.esq], EQP Name: [AgilentRecommended], Proto col Revision :[Gc.02.53] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Config urations/02.54/GcMs.02.54.e sq], EQP File Name: [GcMs.02.54.esq], EQP Name: [AgilentRecommended]
May 8, 2025 2:41:06 PM	End	Configuration	Session	None
May 8, 2025 2:41:09 PM	start	Qualification	Session	OQ
May 8, 2025 2:41:10 PM	start	Execution	CDS Logon Verification - GC - 8890 - Qualitative test	None
May 8, 2025 2:42:42 PM	End	Execution	CDS Logon Verification - GC - 8890 - Qualitative test	Run Count: 1

User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:43:00 PM	start	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	None
May 8, 2025 2:43:16 PM	End	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	Run Count : 1
May 8, 2025 2:43:21 PM	start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 8, 2025 2:44:22 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 8, 2025 2:44:28 PM	start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 2:52:02 PM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 8, 2025 2:52:05 PM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 2:52:13 PM	start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 3:01:36 PM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG8217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

QQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 3:01:39 PM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 3:01:42 PM	start	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
May 8, 2025 3:20:17 PM	Audit	Data	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
May 8, 2025 3:20:19 PM	End	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
May 8, 2025 3:20:42 PM	start	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	None
May 8, 2025 3:25:45 PM	End	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 8, 2025 3:25:48 PM	start	Execution	RPPA - 5977C SQ: - Source: EI - Extractor	None
May 8, 2025 3:36:10 PM	End	Execution	RPPA - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 8, 2025 3:36:50 PM	start	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
May 8, 2025 3:43:21 PM	End	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
May 8, 2025 3:43:27 PM	start	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None

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User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 3:45:57 PM	End	Execution	Tune EI - 5977C SQ: - Source: - Run Count : 1 EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
May 8, 2025 3:46:04 PM	Audit	AceClosed	Session	None
May 9, 2025 9:33:04 AM	Audit	AceRestarted	Session	Host Name: 5CG9217CJG, Drive Serial Number: BC4F1A47
May 9, 2025 9:33:06 AM	Audit	SessionReloaded	Session	None
May 9, 2025 9:33:59 AM	start	Qualification	Session	OQ
May 9, 2025 9:34:19 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 9:35:36 AM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 9:39:00 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 9:39:03 AM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 9:43:57 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None

User Name: phuwanal.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

QQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 10:04:26 AM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 10:04:26 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 1:12:30 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 3:02:09 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 3:03:52 PM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\OQ2025\SC_OFN.D
May 9, 2025 3:04:25 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: 150; Integration: Off at 0; Integration: On at 4]

User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:04:39 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: 100; Integration: Off at 0; Integration: On at 4]
May 9, 2025 3:04:46 PM	Audit	Reporting	Reintegration	Reintegration Count: 3 -- [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.02; Initial Area Reject: 0; Initial Height Reject: 100; Integration: Off at 0; Integration: On at 4]
May 9, 2025 3:05:17 PM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - Part of GCMS System Preparation	Run Count : 1
May 9, 2025 3:05:21 PM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\IDL2.D

User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\DL3.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\DL4.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\DL5.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\DL6.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\DL7.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\DL8.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\ALS_OQ2025\OQ2025\DL9.D

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User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217C.JG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\IDL10.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\IDL11.D
May 9, 2025 3:08:43 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: 50;Integration: Off at 0;Integration: On at 4.6]
May 9, 2025 3:09:07 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 4.6]
May 9, 2025 3:10:29 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Run Count : 1

User Name: phuwanal.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:11:01 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	None
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads ALS_OQ2025\OQ2025\OQ2 025\MRP5.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads ALS_OQ2025\OQ2025\OQ2 025\MRP6.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads ALS_OQ2025\OQ2025\OQ2 025\MRP7.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads ALS_OQ2025\OQ2025\OQ2 025\MRP8.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads ALS_OQ2025\OQ2025\OQ2 025\MRP9.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): ≤ 5.00%	Data files Path : C:\Users\yoktragul\Downloads ALS_OQ2025\OQ2025\OQ2 025\MRP10.D

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User Name: phuwanai.yoktragul

System id: GM-12

Report Generated by Hostname: 5CG9217CJG

Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:13:49 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 2]
May 9, 2025 3:15:04 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count : 1
May 9, 2025 3:16:15 PM	End	Qualification	Session	OQ
May 9, 2025 3:16:15 PM	start	Reporting	Session	None
May 9, 2025 3:26:19 PM	Audit	Reporting	Session	Report Generated : Certificate
May 9, 2025 3:27:20 PM	Audit	Reporting	Session	Report Generated : Report
May 9, 2025 3:28:25 PM	Audit	Reporting	Session	Report Generated : Report with Certificate



Certificate of Calibration

Certificate No. C-030126-RYG_FS0120

Air Sampling Pump Detail

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

Equipment ID : RYG_FS0120
Serial No. : 20180710030
Calibration Date : 03-Jan-26
Next calibration date : 03-Apr-26

Reference Standard Low Flow Meter

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

Equipment ID : BKK_FS0619
Serial No. : 130026
Calibration Date : 10-Sep-25
Due Date : 9-Sep-26

Reference Standard High Flow Meter

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

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

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.3	19.2	19.3	19.3	5%	19 - 21	Passed
50	50.3	50.7	50.8	50.6	5%	48 - 53	Passed
100	101.8	102.1	102.0	102.0	5%	95 - 105	Passed
200	200.2	201.4	201.9	201.2	5%	190 - 210	Passed
High Flow							
500	500.6	504.2	502.0	502.3	3%	485 - 515	Passed
1000	1001.6	1004.6	1001.5	1002.6	3%	970 - 1030	Passed
2000	2000.5	2002.3	2003.1	2002.0	3%	1940 - 2060	Passed
2500	2505.8	2504.1	2503.6	2504.5	3%	2425 - 2575	Passed

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

Calibrated By: 

(Mr. Watcharin Pongsamsuan)
RYG Field Services Scientist (1)

Issue date : 04-Jan-26

Approved By: 

(Mr. Supot Salamteh)
Field Services Section Head



Certificate of Calibration

Certificate No. C-060126-RYG_FS0126

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir PlusEquipment ID : RYG_FS0126
Serial No. : 20150410002
Calibration Date : 06-Jan-26
Next calibration date : 06-Apr-26

Reference Standard Low Flow Meter

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

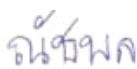
Reference Standard High Flow Meter

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

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)		Evaluation (Pass/ Fail)
	1	2	3					
Low Flow								
20	19.9	20.2	20.4	20.2	5%	19	- 21	Passed
50	50.8	51.0	52.1	51.3	5%	48	- 53	Passed
100	99.4	99.1	99.8	99.4	5%	95	- 105	Passed
200	201.2	204.4	200.5	202.0	5%	190	- 210	Passed
High Flow								
500	501.2	501.5	500.0	500.9	3%	485	- 515	Passed
1000	1005.9	1004.5	1002.8	1004.4	3%	970	- 1030	Passed
2000	2001.4	2001.1	2004.3	2002.3	3%	1940	- 2060	Passed
2500	2501.5	2500.0	2499.2	2500.2	3%	2425	- 2575	Passed
4000	4002.9	3997.5	4002.3	4000.9	3%	3880	- 4120	Passed

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

Calibrated By: 

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 07-Jan-26

Approved By: 

(Mr. Supot Salamteh)

Field Services Section Head

Certificate of System Qualification

GC-OQ

REVIEW BY *Jinda K*

APPROVED BY *Jmm*

NEXT CAL DATE **21/10/26**

System ID:

BKK_EN0126_GC6

Organization Name:

ALS Laboratory Group (Thailand) Co., Ltd.

Organization Location:

104 Soi 40 Phattanakan Rd., Khwang Suan Luang, Khet Suan Luang, BANGKOK 10250

Date:

October 22, 2025 2:51:58 PM

EQP Name:

AgilentRecommended

EQP Revision:

GC.02.53

Overall Qualification Status:

Pass

CDS Logon Verification - GC

Logon:

Suriya Thongkaew

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 Decay

Name:

7890

Front

SSL

Setpoint Status:

Pass

Pressure:

25.0

psi

Pressure Change:

0.3

psi

/5 minutes

Agilent Recommended:

>=

-2.0

and

<=

0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name:	7890			
	Front		SSL	
Setpoint Status:	Pass			

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.2	psi
Accuracy:			0.2	psi
Agilent Recommended:			<=	1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name:	7890			
	Back		SSL	
Setpoint Status:	Pass			

Pressure:	25.0	psi		
Pressure Change:		0.4	psi	/5 minutes
Agilent Recommended:	>=	-2.0	and	<= 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name:	7890			
	Back		SSL	

Setpoint Status: Pass

	Setpoint		Actual
Inlet Pressure:	25.0	psi	25.2
Accuracy:			0.2
Agilent Recommended:		<=	1.2

Overall Inlet Pressure Accuracy Test Status

Pass

22111dijeuifhuie1

Detector Flow Accuracy

Name: 7890

FrontFID

Setpoint Status: Pass

Flow Type: Fuel

Setpoint:	30.0	mL/min	Measured Flow:	30.8	mL/min
Accuracy:		0.8	mL/min		
Agilent Recommended:		<=	10.0	% setpoint	(3.0 mL/min)

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

Setpoint Status: Pass

Flow Type: Oxidizer

Setpoint:	400.0	mL/min	Measured Flow:	396.0	mL/min
Accuracy:		4.0	mL/min		
Agilent Recommended:		<=	10.0	% setpoint	(40.0 mL/min)

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

Setpoint Status: Pass

Flow Type: Makeup

Setpoint:	25.0	mL/min	Measured Flow:	24.7	mL/min
Accuracy:		0.3	mL/min		
Agilent Recommended:		<=	10.0	% setpoint	(2.5 mL/min)

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

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name:	7890		
	Back	FID	

Setpoint Status:	Pass			
Flow Type:	Fuel			
Setpoint:	30.0	mL/min	Measured Flow:	29.5 mL/min
Accuracy:		0.5 mL/min		
Agilent Recommended:	<=	10.0	% setpoint	(3.0 mL/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.				

Setpoint Status:	Pass			
Flow Type:	Oxidizer			
Setpoint:	400.0	mL/min	Measured Flow:	397.0 mL/min
Accuracy:		3.0 mL/min		
Agilent Recommended:	<=	10.0	% setpoint	(40.0 mL/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.				

Setpoint Status:	Pass			
Flow Type:	Makeup			
Setpoint:	25.0	mL/min	Measured Flow:	24.8 mL/min
Accuracy:		0.2 mL/min		
Agilent Recommended:	<=	10.0	% setpoint	(2.5 mL/min)
Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.				

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name:	7890
-------	------

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

230.0

229.1

°C

Accuracy:

-0.9

°C

Agilent Recommended:

>=

-1.0

% setpoint in K

(

-5.0

°C

)

<=

1.0

% setpoint in K

(

5.0

°C

)

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

100.0

99.9

°C

Accuracy:

-0.1

°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

99.95

°C

Stability:

0.1

°C

Agilent Recommended:

<=

0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1

Front

SSL

/ Front

FID

Injection Tower

Name:

7693A

Setpoint Status:

Completed

Injection Volume on Column:

1.0

uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1	Front	SSL	/ Front	FID
Name:	7890			

Setpoint Status:

Pass

Base Signal:

14.3

pA

Agilent Recommended:	ASTM Noise		Drift	
	pA		pA/h	
	0.05		0.03	
	<=	0.10	<=	2.50
	Status: Pass		Pass	

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1	Front	SSL	/ Front	FID
Name:	7693A			

Setpoint Status:

Pass

Injection Volume on Column:

1.0

uL

Area RSD:	0.33	%	Retention Time RSD:	0.10	%
Agilent Recommended:	<=	3.00	<=	1.00	

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination1	Front	SSL	/ Front	FID
	Injection Tower			
Name:	7890			

Setpoint Status:	Pass		
Signal to Noise:		1393680	
Agilent Recommended:	>=	300000	

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2	Back	SSL	/ Back	FID
	Injection Tower			
Name:	7693A			

Setpoint Status:	Completed		
Injection Volume on Column:	1.0	uL	

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2	Back	SSL	/ Back	FID
Name:	7890			

Setpoint Status:	Pass					
Base Signal:	13.3	pA				
		ASTM Noise		Drift		
		pA		pA/h		
		0.05		0.01		
Agilent Recommended:	<=	0.10	<=	2.50		
Status:	Pass			Pass		

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2	Back	SSL	/ Back	FID
Name:	7693A			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0	uL		
Area RSD:	0.43	%	Retention Time RSD:	0.09 %
Agilent Recommended:	<= 3.00		<= 1.00	

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2	Back	SSL	/ Back	FID
	Injection Tower			
Name:	7890			
Setpoint Status:	Pass			
Signal to Noise:	1251862			
Agilent Recommended:	>= 300000			

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	BKK_EN0126_GC6
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
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No

Tested Combination2

Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Back
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN10340103
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

Sampler 3

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN18250032
Firmware Revision	A.12.04
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	A.01.16
Component ID/Asset No.	BKK_EN0126_GC-6
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

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	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Electronic Signature

Purpose

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

Details

Full Name of Signer:	Suriya Thongkaew
Logged On User Name:	suriya.thongkaew@non.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.

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User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 1:44:51 PM	Audit	SessionCreated	Session	Host Name: DESKTOP-2H6MTKJ, Drive Serial Number: 76C1E981
October 21, 2025 1:44:51 PM	start	Configuration	Session	None
October 21, 2025 1:44:51 PM	Audit	Entitlement	Licensing	Session identifier generated: XYP0-PNEJ-0W00-0RZ5-HR 80
October 21, 2025 1:48:11 PM	Audit	Entitlement	Licensing	Successfully unlocked session identified by XYP0-PNEJ-0W00-0RZ5-HR 80 with unlock code 76BX-519E-XKYY-1JR1-JR6 0
October 21, 2025 1:57:15 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurat ions/02.53/Gc.02.53.eqp], EQP File Name: [Gc.02.53.eqp], EQP Name: [AgilentRecommended], Proto col Revision :[Gc.02.53]
October 21, 2025 1:57:39 PM	End	Configuration	Session	None
October 21, 2025 1:57:46 PM	start	Qualification	Session	OQ
October 21, 2025 1:57:46 PM	start	Execution	CDS Logon Verification - GC - 7890: - Qualitative test	None
October 21, 2025 2:18:54 PM	End	Execution	CDS Logon Verification - GC - 7890: - Qualitative test	Run Count : 1

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 2:19:27 PM	start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 21, 2025 2:19:47 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1
October 21, 2025 2:19:50 PM	start	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2025 2:25:44 PM	End	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2025 2:25:52 PM	start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2025 2:28:43 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 2:28:45 PM	start	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2025 2:33:42 PM	End	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2025 2:33:50 PM	start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 2:34:27 PM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2025 2:34:32 PM	start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2025 2:50:39 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2025 2:50:41 PM	start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2025 2:50:45 PM	start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2025 2:50:53 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2025 2:50:56 PM	start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2025 2:54:08 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2025 2:54:15 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
October 21, 2025 2:54:31 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2025 2:54:34 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

Page 3 / 12

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 2:54:48 PM	start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2025 2:57:00 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2025 2:57:03 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2025 2:57:38 PM	start	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2025 3:00:15 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2025 3:00:17 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2025 3:00:20 PM	start	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2025 3:03:03 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2025 3:03:06 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2025 3:03:08 PM	start	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2025 3:07:25 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry

Page 4 / 12

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 3:07:28 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2025 3:07:53 PM	start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	21 None
October 21, 2025 3:21:20 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 3:21:22 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 3:21:36 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 3:30:43 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
October 21, 2025 3:30:45 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 3:30:48 PM	start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 21, 2025 3:50:20 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2025 3:50:24 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 21, 2025 3:50:31 PM	start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 21, 2025 3:55:30 PM	Audit	AceClosed	Session	None
October 22, 2025 10:10:41 AM	Audit	AceRestarted	Session	Host Name: DESKTOP-2H6MTKJ, Drive Serial Number: 76C1E981
October 22, 2025 10:10:42 AM	Audit	SessionReloaded	Session	None
October 22, 2025 10:10:44 AM	start	Qualification	Session	OQ
October 22, 2025 10:10:45 AM	start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 22, 2025 2:15:45 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
October 22, 2025 2:16:36 PM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : D:\ALS GC-6\OQ2025\SCOUTING_01.D\FID1A.ch

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 2:17:00 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: 100; Integration: Off at 0; Integration: On at 0.1; Integration: Off at 0.5]
October 22, 2025 2:17:42 PM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
October 22, 2025 2:17:53 PM	start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2025 2:19:13 PM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : D:\ALS GC-6\OQ2025\OQ2025 2025-10-22 11-05-22\SIGNSDRF_F_01.D\FID1A.ch
October 22, 2025 2:19:28 PM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
October 22, 2025 2:19:30 PM	start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 2:19:56 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025\OQ2025 2025-10-22 11-05-22\INJPREC_F_02.D\FID1A.ch
October 22, 2025 2:19:56 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025\OQ2025 2025-10-22 11-05-22\INJPREC_F_03.D\FID1A.ch
October 22, 2025 2:19:56 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025\OQ2025 2025-10-22 11-05-22\INJPREC_F_04.D\FID1A.ch
October 22, 2025 2:19:56 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025\OQ2025 2025-10-22 11-05-22\INJPREC_F_05.D\FID1A.ch
October 22, 2025 2:19:56 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025\OQ2025 2025-10-22 11-05-22\INJPREC_F_06.D\FID1A.ch
October 22, 2025 2:19:56 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025\OQ2025 2025-10-22 11-05-22\INJPREC_F_07.D\FID1A.ch

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 2:20:04 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: 100; Integration: Off at 0; Integration: On at 0.1; Integration: Off at 0.5]
October 22, 2025 2:20:24 PM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 22, 2025 2:20:34 PM	start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	None
October 22, 2025 2:20:58 PM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : D:\ALS GC-6\OQ2025\OQ2025 2025-10-22 11-05-22\SIGTONS_F_01.D\FID1A.ch
October 22, 2025 2:21:06 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: 100; Integration: Off at 0; Integration: On at 0.1; Integration: Off at 0.5]
October 22, 2025 2:21:19 PM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Run Count : 1

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 2:21:25 PM	start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	None
October 22, 2025 2:25:23 PM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Data files Path : D:\ALS GC-6\OQ2025_B\SCOUTING _B_01.D\FID2B.ch
October 22, 2025 2:26:18 PM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Run Count : 1
October 22, 2025 2:26:21 PM	start	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2025 2:27:00 PM	Audit	Data	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : D:\ALS GC-6\OQ2025_B\OQ2025 2025-10-22 11-05-22\SIGNSDRF_B_01. D\FID2B.ch
October 22, 2025 2:27:42 PM	End	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
October 22, 2025 2:27:46 PM	start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
October 22, 2025 2:28:07 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025_B\OQ2025 2025-10-22 11-05-22\INJPREC_B_02.D\ FID2B.ch

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 2:28:07 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025_B\OQ2025 2025-10-22 11-05-22\INJPREC_B_03.D\FID2B.ch
October 22, 2025 2:28:07 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025_B\OQ2025 2025-10-22 11-05-22\INJPREC_B_04.D\FID2B.ch
October 22, 2025 2:28:07 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025_B\OQ2025 2025-10-22 11-05-22\INJPREC_B_05.D\FID2B.ch
October 22, 2025 2:28:07 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025_B\OQ2025 2025-10-22 11-05-22\INJPREC_B_06.D\FID2B.ch
October 22, 2025 2:28:07 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : D:\ALS GC-6\OQ2025_B\OQ2025 2025-10-22 11-05-22\INJPREC_B_07.D\FID2B.ch
October 22, 2025 2:28:21 PM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 22, 2025 2:28:28 PM	start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	None

User Name: suriya.thongkaew

System Id: BKK_EN0126_GC6

Report Generated by Hostname: DESKTOP-2H6MTKJ

Print Date: October 22, 2025 2:52:00 PM

OQ2025 GC ALS GC-6 CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2025 2:28:47 PM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	Data files Path : D:\ALS GC-6\OQ2025_B\OQ2025 2025-10-22 11-05-22\SIGTONS_B_01.D\FID2B.ch
October 22, 2025 2:29:53 PM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	Run Count : 1
October 22, 2025 2:30:01 PM	End	Qualification	Session	OQ
October 22, 2025 2:30:01 PM	start	Reporting	Session	None
October 22, 2025 2:50:41 PM	Audit	Reporting	Session	Report Generated : Certificate
October 22, 2025 2:51:22 PM	Audit	Reporting	Session	Report Generated : Report

Accredited by

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	REVIEW BY <i>Thanitak.</i>
Number of pages	4	APPROVED BY <i>D. Janssen</i>
Date of calibration	03 Feb 2026	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	03 Feb 2026	Approval of the Calibration Certificate	Person in charge
			
		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. <i>T</i> _{weights} - <i>T</i> _{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
	<i>s</i> = 0.00003 g	<i>s</i> = 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_{ecc} _{max} = 0.0001\text{ g}$	

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> (<i>E</i>)	<i>U</i> _{rel} (<i>E</i>)
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\text{ 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	$1 \cdot 10^{-6}/\text{K}$

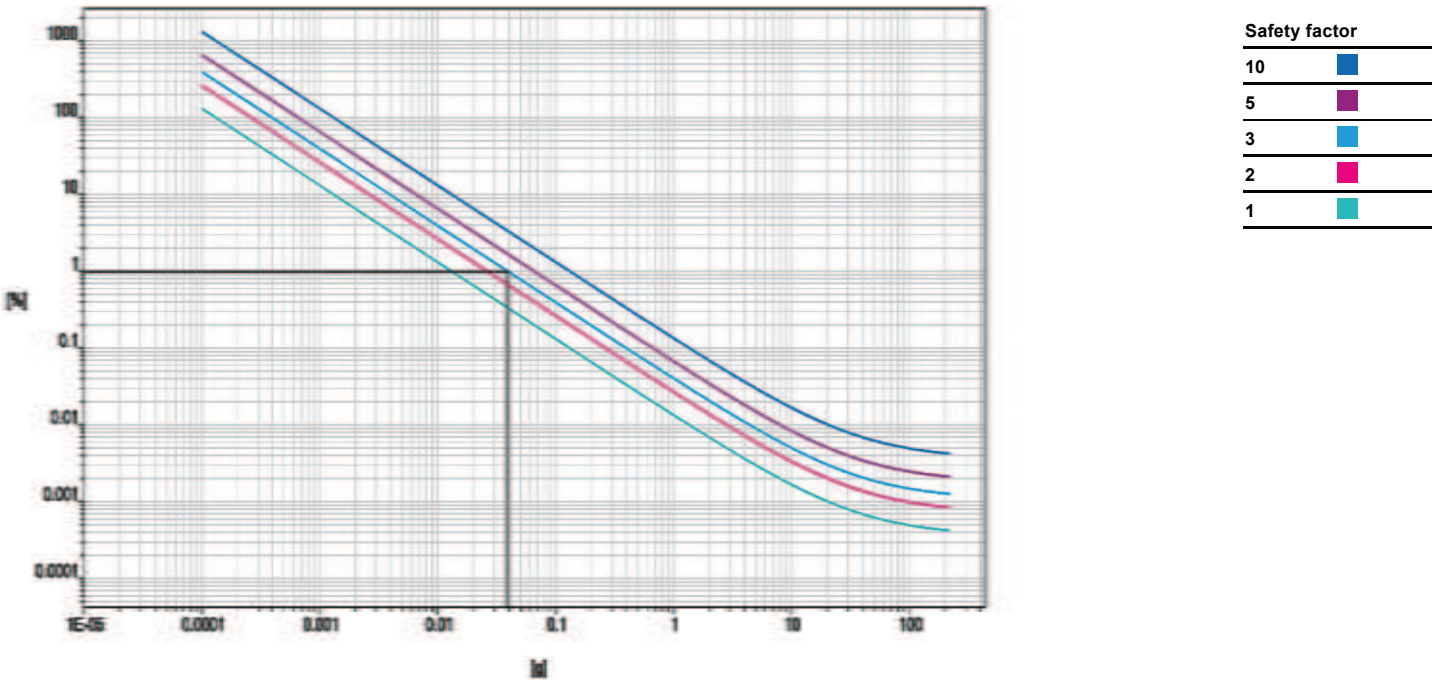
Uncertainty of the weighing result $U_{gl}(W)$

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

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

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM 12
Organization Name: ALS Laboratory Group (Thailand) Co Ltd
Organization Location: 104 Phatthanakan 40 Phatthanakan Rd Bangkok 10250

Date: May 8, 2026 2:09:21 PM
EQP Name: AgilentRecommended , AgilentRecommended

EQP Revision: GC.02.54, GCMS.02.54
Overall Qualification Status: Pass

REVIEW BY Suchada T.

APPROVED BY Tamratom M.

NEXT CAL. DATE 7 May 27

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 8890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 8890

Front SSL

Setpoint Status: Pass

	Setpoint		Actual	
Inlet Pressure:	25.0	psi	25.1	psi
Accuracy:			0.1	psi
Agilent Recommended:			<= 1.2	

Date: May 8, 2026 2:09:21 PM
System ID: GM 12

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 8890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.1 °C

Accuracy: 0.1 °C

Agilent Recommended: $\geq$ -1.0 % setpoint in K (-5.0 °C) $\leq$ 1.0 % setpoint in K (5.0 °C)**Setpoint Status:** Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.1 °C

Accuracy: 0.1 °C

Agilent Recommended: $\geq$ -1.0 % setpoint in K (-3.7 °C) $\leq$ 1.0 % setpoint in K (3.7 °C)**Overall GC Oven Temperature Accuracy Test Status**

Pass

GC Oven Temperature Stability

Name: 8890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.1 °C

Stability: 0.0 °C

Agilent Recommended: $\leq$ 0.5**Overall GC Oven Temperature Stability Test Status**

Pass

Log Amp

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977C			
Setpoint Status:	Pass			
Overall Log Amp Test Status				
Pass				

RFPA

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977C			
Setpoint Status:	Pass			
Amu:	1050	m/z	Drift After Five Minutes:	RFPA Voltage:
			10 mV	503 mV
Agilent Recommended:	>=	-100	and	<= 100
				<= 1100
Overall RFPA Test Status				
Pass				

Tune EI

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977C			
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 - Extractor			
Setpoint Status:	Completed			
Injection Volume on Column:	1.0	uL		
Overall Scouting Run Status	Completed			

Instrument Detection Limit

Tested Combination1	Front	SSL	/ External	SQ	
Injection Tower					
Name:	7693A				
Source:	EI - Extractor				
Setpoint Status:	Pass				
Injection Volume on Column:	1.0	uL			
Minimum RSD:	0.86	%	Retention Time	0.01	%
Agilent Recommended:	<=	5.00	<=	1.00	
Status:	Pass		Pass		
Instrument Detection Limit:	2.89411	fg			
Agilent Recommended:	<=	16.82500			
Status:	Pass				
Overall Instrument Detection Limit Test Status	Pass				

Mass Ratio Precision

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0	uL		
	Area Mass 1	Mass Ratio		
	Abundance*s			
RSD:	1.81	%		
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 12
Manufacturer	Agilent Technologies
Name	8890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

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

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN23125102
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN23147049
Firmware Revision	A.12.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A031
Firmware Revision	3.0.3.21
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977C
Model Number	G7077C
Serial Number	US2307MA35
Firmware Revision	6.00.35
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

MS EI Source 1

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

Electronic Signature

Purpose

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Full Name of Signer:	Phuwanai Yoktragul
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Signature Creation Date:	May 8, 2026
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.

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.

Warranty

Agilent Technologies makes no warranty of any kind to this material, including but not limited to, the implied warranties or merchantability and fitness for a particular purpose. Agilent Technologies shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM 12
Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 7, 2026 4:56:22 PM	Audit	SessionCreated	Session	Host Name: AG-TLFWX1PSE7WG, Drive Serial Number: 867E60CE
May 7, 2026 4:56:22 PM	start	Configuration	Session	None
May 7, 2026 4:56:22 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
May 7, 2026 5:05:25 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurat ions/02.54/Gc.02.54.eqp], EQP File Name: [Gc.02.54.eqp], EQP Name: [AgilentRecommended],Proto col Revision :[Gc.02.54] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Config urations/02.54/GcMs.02.54.e qp], EQP File Name: [GcMs.02.54.eqp], EQP Name: [AgilentRecommended]
May 7, 2026 5:05:32 PM	End	Configuration	Session	None
May 7, 2026 5:05:41 PM	start	Qualification	Session	OQ
May 7, 2026 5:05:41 PM	start	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	None
May 7, 2026 5:07:21 PM	End	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	Run Count : 1

User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM 12
Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 7, 2026 5:07:24 PM	start	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	None
May 7, 2026 5:07:38 PM	End	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	Run Count : 1
May 7, 2026 5:07:46 PM	start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 7, 2026 5:08:48 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 7, 2026 5:08:51 PM	start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 7, 2026 5:15:21 PM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 7, 2026 5:15:23 PM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 7, 2026 5:15:26 PM	start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 7, 2026 5:20:08 PM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM 12
Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 7, 2026 5:20:11 PM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 7, 2026 5:20:13 PM	start	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
May 7, 2026 5:40:26 PM	Audit	Data	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
May 7, 2026 5:40:31 PM	End	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
May 7, 2026 5:40:36 PM	start	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	None
May 7, 2026 5:42:32 PM	End	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 7, 2026 5:42:33 PM	start	Execution	RFPA - 5977C SQ: - Source: EI - Extractor	None
May 7, 2026 5:54:23 PM	End	Execution	RFPA - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 7, 2026 5:55:22 PM	start	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
May 7, 2026 6:15:48 PM	End	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
May 7, 2026 6:15:50 PM	start	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None

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User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM 12
Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 7, 2026 6:23:14 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 7, 2026 6:23:17 PM	start	Execution	Tune EI - 5977C SQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
May 7, 2026 6:23:25 PM	End	Execution	Tune EI - 5977C SQ: - Source: - EI - Extractor Filament 2 (Qualitative - No setpoints associated)	Run Count : 1
May 7, 2026 6:23:28 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 7, 2026 6:23:52 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 7, 2026 6:33:32 PM	Audit	AceClosed	Session	None
May 8, 2026 12:51:31 PM	Audit	AceRestarted	Session	Host Name: AG-TLFWX1PSE7WG, Drive Serial Number: 867E60CE
May 8, 2026 12:51:33 PM	Audit	SessionReloaded	Session	None
May 8, 2026 12:51:36 PM	start	Qualification	Session	OQ
May 8, 2026 12:51:37 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None

User Name: phuwanai.yoktragul

System Id: GM 12

Report Generated by Hostname: AG-TLFWX1PSE7WG

Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2026 12:51:54 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 8, 2026 12:53:14 PM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Data files Path : D:\Transfer Option3\IDL\SC001.D
May 8, 2026 12:53:38 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: 100;Integration: Off at 0;Integration: On at 4]
May 8, 2026 12:54:08 PM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Run Count : 1
May 8, 2026 12:54:12 PM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL004.D

User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM 12
Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL005.D
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL006.D
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL007.D
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL008.D
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL009.D
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL010.D
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL011.D

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User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM 12
Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL012.D
May 8, 2026 12:55:04 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL013.D
May 8, 2026 12:55:26 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL003.D
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL004.D
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL005.D
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL006.D

User Name: phuwanai.yoktragul

System Id: GM 12

Report Generated by Hostname: AG-TLFWX1PSE7WG

Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL007.D
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL008.D
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL009.D
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL010.D
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL011.D
May 8, 2026 12:56:11 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : D:\Transfer Option3\IDL\IDL012.D

User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM 12
Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2026 12:56:28 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 100;Integration: Off at 0;Integration: On at 5]
May 8, 2026 12:57:09 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.02;Initial Area Reject: 0;Initial Height Reject: 100;Integration: Off at 0;Integration: On at 5]
May 8, 2026 12:57:41 PM	Audit	Reporting	Reintegration	Reintegration Count: 3 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.02;Initial Area Reject: 0;Initial Height Reject: 150;Integration: Off at 0;Integration: On at 5]
May 8, 2026 12:58:19 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Run Count : 1
May 8, 2026 12:59:00 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None

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User Name: phuwanai.yoktragul
Report Generated by Hostname: AG-TLFWX1PSE7WG

System Id: GM 12
Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2026 1:26:47 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\Transfer Option3\IDL\MRP2.D
May 8, 2026 1:26:47 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\Transfer Option3\IDL\MRP3.D
May 8, 2026 1:26:47 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\Transfer Option3\IDL\MRP4.D
May 8, 2026 1:26:47 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\Transfer Option3\IDL\MRP5.D
May 8, 2026 1:26:47 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\Transfer Option3\IDL\MRP6.D
May 8, 2026 1:26:47 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\Transfer Option3\IDL\MRP7.D
May 8, 2026 1:27:14 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: 50000;Integration: Off at 0;Integration: On at 3.5]

User Name: phuwanai.yoktragul

System Id: GM 12

Report Generated by Hostname: AG-TLFWX1PSE7WG

Print Date: May 8, 2026 2:09:28 PM

OQ2026_ALS_GM12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2026 1:28:01 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count : 1
May 8, 2026 1:35:44 PM	End	Qualification	Session	OQ
May 8, 2026 1:35:44 PM	start	Reporting	Session	None
May 8, 2026 1:56:33 PM	Audit	Reporting	Session	Report Generated : Certificate
May 8, 2026 1:58:24 PM	Audit	Reporting	Session	Report Generated : Report

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd. **Certificate No** : 25-ACT-042
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, **Request No** : Req-2025-0604
Bangkok 10250

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : RION Range : 94 dB / 1000 Hz
Model : NC-75 Instrument Status : Used
Serial Number : 35002736
ID : RYG_FS0496

Calibration Environment and Details

Temperature : (23 $\pm$ 2 °C)
Humidity : (50 $\pm$ 20 %RH)
Barometric Pressure : (1013 $\pm$ 10.0 hPa)
Received Date : 6 March 2025
Calibration Date : 19 March 2025
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

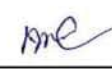
REVIEW BY 
APPROVED BY 
NEXT CAL DATE 19/03/26

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	12 June 2025
THD Multimeter	2015	1047765	NIMT	4 February 2026

Traceability : This certificate provides 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 : 19 March 2025

Certificate No : 25-ACT-042

Request No : Req-2025-0604

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	94.06	0.06	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.98	-	0.40	2.5	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

Certificate No : 25-ACT-042

Request No : Req-2025-0604

Decision Rule for Statements of Conformity

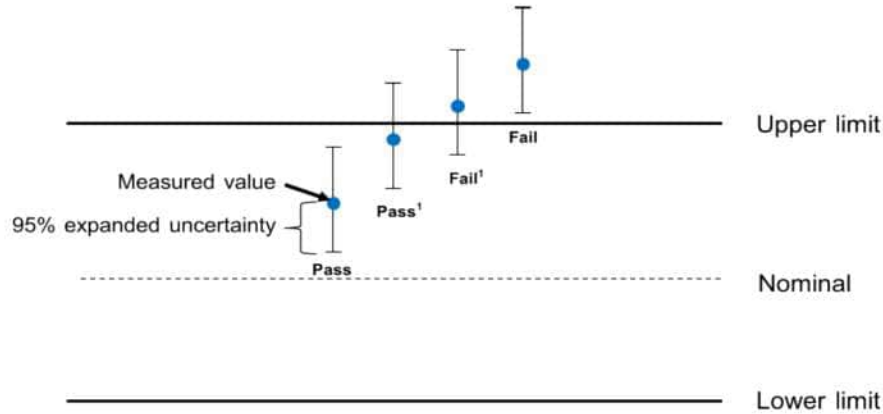
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

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

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

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



End of Calibration

Cert. No. : ACL26079

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734225 / 179117 / 87524
ID No.: RYG_FS0030

Condition As Found : GOOD

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

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

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

REVIEW BY *Supt S*

APPROVED BY *[Signature]*

NEXT CAL DATE 20/ 01/ 2027

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

Nitinun S.
(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. : ACL26079

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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26079

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. : ACL26079

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	11.9
C - weight	18.1
Flat	23.8

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	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.2	1.9	1.9	±5.0

Cert. No. : ACL26079

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	0.0	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

Mr. P. S.

Cert. No. : ACL26079

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	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	38.9	-0.1	± 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	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

Cert. No. : ACL26079
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	134.1	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. : ACL26079
Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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	89.5	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, Bangbunru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN
associates



Cert. No. : ACL26077

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233184 / 144837 / 23232
ID No.: RYG_FS0025

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 $\pm$ 3) °C
Pressure : (101.3 $\pm$ 3) kPa
Relative Humidity : (50.0 $\pm$ 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. : ACL26077

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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26077
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. : ACL26077

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)
18.3

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

Frequency Weighting	Weighting (dB)
A - weight	11.6
C - weight	17.9
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	0.2	0.3	0.4	± 1.5
1000	0.0	0.0	0.1	± 1.0
8000	-0.2	-0.1	-0.1	±5.0

Cert. No. : ACL26077

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	0.0	±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

Checked by S.

Cert. No. : ACL26077
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	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	63.9	-0.1	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 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. : ACL26077
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. : ACL26077
Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{cpeak} (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	89.6	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

Cert. No. : ACL26105

Pages : 1 of 8

Calibration Certificate

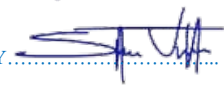
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734220 / 171593 / 34371
ID No.: RYG_FS0026

Condition As Found : GOOD

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

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

Received Date : 12 JANUARY 2026
Calibration Date : 28-30 JANUARY 2026
Date of Issue : 02 FEBRUARY 2026

REVIEW BY	
APPROVED BY	
NEXT CAL DATE	27/ 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. : ACL26105
Job No. : VC69AC0058
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. : ACL26105

Job No. : VC69AC0058

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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26105
Job No. : VC69AC0058
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)
14.4

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	16.0
Flat	21.8

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	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.6	-0.5	-0.5	±5.0

Cert. No. : ACL26105

Job No. : VC69AC0058

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	0.0	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

NOTED: 6.1

Cert. No. : ACL26105
Job No. : VC69AC0058
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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

Cert. No. : ACL26105

Job No. : VC69AC0058

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. : ACL26105
Job No. : VC69AC0058
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{cpeak} (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	89.6	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

Signature



Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Certificate No : 26-ACT-007

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

Request No : Rcq-2026-0043

Unit Under Calibration Details

Measurement item : Acoustic Calibrator

Class : 1

Manufacturer : RION

Range : 94 dB / 1000 Hz

Model : NC-74

Instrument Status : Used

Serial Number : 34178121

ID : RYG_FS0213

Calibration Environment and Details

Temperature : (23 $\pm$ 2 °C)

Humidity : (50 $\pm$ 20 %RH)

Barometric Pressure : (1013 $\pm$ 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... 08/ 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 February 2026

Traceability : This certificate provides 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



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	94.08	0.08	-	-	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 volume correction

End of Calibration

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,
KHWANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 $\pm$ 3) °C
Pressure : (101.3 $\pm$ 3) kPa
Relative Humidity : (50.0 $\pm$ 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. : 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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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

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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

01/10/2015

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

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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, L _{cpeak} (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

Mitras

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : 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,
KHWANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

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

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

REVIEW BY *Supt S.*
APPROVED BY *[Signature]*
NEXT CAL DATE 20/ 01/ 2027

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

[Signature]
(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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : 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

MEASURING

Cert. No. : ACL26075

Job No. : VC69AC0053

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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

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Job No. : VC69AC0053

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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

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Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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

Signature

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : ACL26076

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01222716 / 143832 / 22763
ID No.: RYG_FS0020

Condition As Found : GOOD

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

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

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

REVIEW BY	<i>Supt S</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL DATE	20/ 01/ 2027

Calibrated by : Nathakorn Pisutpaisan

Approved by : *Nitinun Srihawan*
(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. : ACL26076
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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26076
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. : ACL26076

Job No. : VC69AC0053

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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)
14.6

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	17.3
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	0.7	0.7	0.7	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	-0.6	-0.5	-0.5	±5.0

Cert. No. : ACL26076

Job No. : VC69AC0053

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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	-0.1	-0.1	±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

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Cert. No. : ACL26076

Job No. : VC69AC0053

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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	78.9	-0.1	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 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	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. : ACL26076

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	28.8	-0.2	±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

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Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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	89.6	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

(Signature)

Cert. No. : ACL26103

Pages : 1 of 8

Calibration Certificate

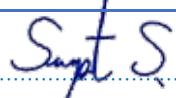
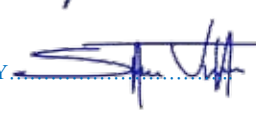
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233183 / 157777 / 22653
ID No.: RYG_FS0024

Condition As Found : GOOD

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

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

Received Date : 12 JANUARY 2026
Calibration Date : 28-30 JANUARY 2026
Date of Issue : 02 FEBRUARY 2026

REVIEW BY	
APPROVED BY	
NEXT CAL DATE	27/ 01/ 2027

Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(Nitinun Srihawan)

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Cert. No. : ACL26103
Job No. : VC69AC0058
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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26103

Job No. : VC69AC0058

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. : ACL26103

Job No. : VC69AC0058

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)
17.6

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

Frequency Weighting	Weighting (dB)
A - weight	12.4
C - weight	18.5
Flat	24.3

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	0.6	0.6	± 1.5
1000	0.0	0.1	0.1	± 1.0
8000	-1.4	-1.3	-1.3	±5.0

Cert. No. : ACL26103

Job No. : VC69AC0058

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	-0.1	±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

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Cert. No. : ACL26103
Job No. : VC69AC0058
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	93.9	-0.1	± 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. : ACL26103
Job No. : VC69AC0058
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. : ACL26103
Job No. : VC69AC0058
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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	135.1	-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

NGTC-001-5

Cert. No. : ACL26077

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233184 / 144837 / 23232
ID No.: RYG_FS0025

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 $\pm$ 3) °C
Pressure : (101.3 $\pm$ 3) kPa
Relative Humidity : (50.0 $\pm$ 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. : ACL26077

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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26077
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. : ACL26077

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)
18.3

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

Frequency Weighting	Weighting (dB)
A - weight	11.6
C - weight	17.9
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	0.2	0.3	0.4	± 1.5
1000	0.0	0.0	0.1	± 1.0
8000	-0.2	-0.1	-0.1	±5.0

Cert. No. : ACL26077
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	0.0	±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

Checked by

Cert. No. : ACL26077
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	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	63.9	-0.1	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 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. : ACL26077
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. : ACL26077
Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{cpeak} (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	89.6	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

CH220004

Cert. No. : ACL26105

Pages : 1 of 8

Calibration Certificate

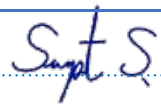
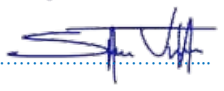
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734220 / 171593 / 34371
ID No.: RYG_FS0026

Condition As Found : GOOD

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

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

Received Date : 12 JANUARY 2026
Calibration Date : 28-30 JANUARY 2026
Date of Issue : 02 FEBRUARY 2026

REVIEW BY	
APPROVED BY	
NEXT CAL DATE	27/ 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. : ACL26105
Job No. : VC69AC0058
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. : ACL26105

Job No. : VC69AC0058

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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26105

Job No. : VC69AC0058

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)
14.4

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	16.0
Flat	21.8

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	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.6	-0.5	-0.5	±5.0

Cert. No. : ACL26105

Job No. : VC69AC0058

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	0.0	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

NOTED: 6.1

Cert. No. : ACL26105
Job No. : VC69AC0058
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	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. : ACL26105

Job No. : VC69AC0058

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. : ACL26105
Job No. : VC69AC0058
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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	89.6	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

Signature

Cert. No. : ACL26078

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Calibration Certificate

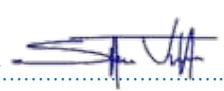
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734221 / 187363 / 23230
ID No.: RYG_FS0027

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 $\pm$ 3) °C
Pressure : (101.3 $\pm$ 3) kPa
Relative Humidity : (50.0 $\pm$ 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. : ACL26078
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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26078
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. : ACL26078

Job No. : VC69AC0053

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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)
15.1

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	17.6
Flat	23.4

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	0.4	0.4	0.5	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	1.4	1.5	1.5	±5.0

Cert. No. : ACL26078

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	0.1	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	0.0	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. : ACL26078

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	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. : ACL26078
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	134.1	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. : ACL26078
Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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	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	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

Signature

Cert. No. : ACL26079

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734225 / 179117 / 87524
ID No.: RYG_FS0030

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 $\pm$ 3) °C
Pressure : (101.3 $\pm$ 3) kPa
Relative Humidity : (50.0 $\pm$ 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)

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Cert. No. : ACL26079
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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26079

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. : ACL26079

Job No. : VC69AC0053

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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	11.9
C - weight	18.1
Flat	23.8

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	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.2	1.9	1.9	±5.0

Cert. No. : ACL26079

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	0.0	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

Mr. P. S.

Cert. No. : ACL26079

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	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	38.9	-0.1	± 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	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

Cert. No. : ACL26079
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	134.1	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. : ACL26079
Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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	89.5	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

Cert. No. : ACL26080

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472126 / 66239 / 88180
ID No.: RYG_FS0301

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 $\pm$ 3) °C
Pressure : (101.3 $\pm$ 3) kPa
Relative Humidity : (50.0 $\pm$ 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. : ACL26080
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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26080
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. : ACL26080

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)
23.6

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	16.8
Flat	22.9

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	0.1	0.1	0.2	± 1.5
1000	0.1	0.1	0.2	± 1.0
8000	0.8	0.9	0.9	±5.0

Cert. No. : ACL26080

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	0.1	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	94.0	0.0	± 0.3

Cert. No. : ACL26080

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	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	27.9	-0.1	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

Cert. No. : ACL26080

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	134.1	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. : ACL26080
Job No. : VC69AC0053
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (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

Signature

Cert. No. : ACL25409

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472127 / 169440 / 72461
ID No.: RYG_FS0302

Condition As Found : GOOD

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

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

Received Date : 20 OCTOBER 2025
Calibration Date : 29 - 30 OCTOBER 2025
Date of Issue : 31 OCTOBER 2025

REVIEW BY	
APPROVED BY	
NEXT CAL DATE	28/ 10/ 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. : ACL25409
Job No. : VC69AC0014
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. : ACL25409
Job No. : VC69AC0014
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. : ACL25409

Job No. : VC69AC0014

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)
18.1

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

Frequency Weighting	Weighting (dB)
A - weight	12.6
C - weight	18.7
Flat	24.4

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	0.6	0.7	0.6	±5.0

Cert. No. : ACL25409

Job No. : VC69AC0014

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	-0.1	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. : ACL25409

Job No. : VC69AC0014

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	63.9	-0.1	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 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. : ACL25409
Job No. : VC69AC0014
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	128.1	0.1	±1.0

Cert. No. : ACL25409
Job No. : VC69AC0014
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{cpeak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.2	-0.2	±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		
89.6	89.6	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

Cert. No. : ACL25316

Pages : 1 of 8

Calibration Certificate

Equipment : 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,
KHWAEANG 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 Ekpongpradit)

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

Cert. No. : 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

Cert. No. : ACL25316

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

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{cpeak} (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

Cert. No. : ACL26107

Pages : 1 of 8

Calibration Certificate

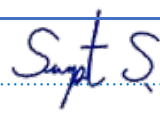
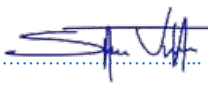
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00900072 / 188465 / 01734
ID No.: RYG_FS0493

Condition As Found : GOOD

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

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

Received Date : 12 JANUARY 2026
Calibration Date : 28-30 JANUARY 2026
Date of Issue : 02 FEBRUARY 2026

REVIEW BY	
APPROVED BY	
NEXT CAL DATE.....	27/ 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. : ACL26107
Job No. : VC69AC0058
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 :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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. : ACL26107
Job No. : VC69AC0058
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. : ACL26107

Job No. : VC69AC0058

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)
14.2

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

Frequency Weighting	Weighting (dB)
A - weight	10.4
C - weight	17.2
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	0.6	0.6	0.6	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-0.5	-0.4	-0.4	±5.0

Cert. No. : ACL26107

Job No. : VC69AC0058

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	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±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

Signature

Cert. No. : ACL26107

Job No. : VC69AC0058

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	78.9	-0.1	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	58.9	-0.1	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 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	24.8	-0.2	± 1.1

MS. S.

Cert. No. : ACL26107

Job No. : VC69AC0058

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	28.8	-0.2	±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. : ACL26107
Job No. : VC69AC0058
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 level of confidence of approximately 95 %

End of Calibration Certificate

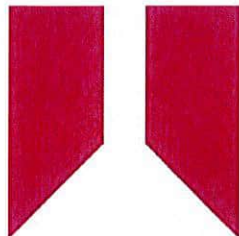
Nitkorn S.

CERTIFICATE OF CALIBRATION

RYG_FS0497

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **17 September 2025** CERTIFICATE NUMBER **249519**



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

N.Smith

Electronically signed:

doseBadge Reader : IEC 60942:2003

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: RC:110A

Serial number: 104777

Class: 2

Test summary

Date of calibration: 17 September 2025

The doseBadge reader detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

REVIEW BY

APPROVED BY

NEXT CAL DATE.....16/ 09/ 2026

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

249519

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 100.30 kPa	Temperature: 22.2 °C	Humidity: 48.6 %
After	Pressure: 100.30 kPa	Temperature: 22.3 °C	Humidity: 50 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	1053426
Environmental Monitor	Comet	T7510	21962628

Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.52	113.51	113.50	113.51	-0.49	±0.75	0.11 dB
Distortion (%)	< 4.00	0.35	0.34	0.32	0.34	0.34	+4.00	0.13 %
Frequency (Hz)	1000.0	990.6	990.6	990.7	990.6	-9.4	±20.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

Adjusted Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	114.00	114.01	114.03	114.01	0.01	±0.75	0.11 dB
Distortion (%)	< 4.00	0.45	0.46	0.47	0.46	0.46	+4.00	0.13 %
Frequency (Hz)	1000.0	990.7	990.6	990.7	990.6	-9.4	±20.0	0.1 Hz

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

End of results



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
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Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Acoustic calibration laboratory
Calibration services department.

REVIEW BY *Supt S.*

APPROVED BY *[Signature]*

NEXT CAL DATE 03/ 09/ 2026

Calibration report Number

CDM-043-68

CALIBRATION REPORT

Page 1 of 1 Pages

MEASUREMENT ITEM : Dose meter
MANUFACTURER : Cirrus Research plc
MODEL/TYPE : CR:110AIS
SERIAL NUMBER : YF475
ID NUMBER : RYG_FS0036
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 : 02 Sep 2025
MEASUREMENT DATE : 04 Sep 2025
ISSUE DATE : 04 Sep 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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

Calibration procedure:

The Noise dosimeter (Unit Under Calibration) was calibrated against Standard dosebadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

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 Cirrus research plc via Certificate number: 248239

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc. Model: RC:110A Serial number: 81051

Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:

Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level ¹ (dB)	Noise Dosimeter reading ² (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ The decibel level of standard doseBadge reader that supplied to Unit Under Calibration.

² The measurement reading of Unit Under Calibration.



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
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Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Acoustic calibration laboratory
Calibration services department.

REVIEW BY *Supt S*

APPROVED BY *[Signature]*

NEXT CAL DATE 03/ 09/ 2026

Calibration report Number

CDM-044-68

CALIBRATION REPORT

Page 1 of 1 Pages

MEASUREMENT ITEM : Dose meter
MANUFACTURER : Cirrus Research plc
MODEL/TYPE : CR:110AIS
SERIAL NUMBER : YF476
ID NUMBER : RYG_FS0037
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 : 02 Sep 2025
MEASUREMENT DATE : 04 Sep 2025
ISSUE DATE : 04 Sep 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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

Calibration procedure:

The Noise dosimeter (Unit Under Calibration) was calibrated against Standard dosebadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

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 Cirrus research plc via Certificate number: 248239

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc. Model: RC:110A Serial number: 81051

Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:

Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level ¹ (dB)	Noise Dosimeter reading ² (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ The decibel level of standard doseBadge reader that supplied to Unit Under Calibration.

² The measurement reading of Unit Under Calibration.



JIRANATEE ASSOCIATES CO.,LTD.

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Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

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

Acoustic calibration laboratory
Calibration services department.

REVIEW BY Supt S.

APPROVED BY [Signature]

NEXT CAL DATE 03/ 09/ 2026

Calibration report Number

CDM-045-68

CALIBRATION REPORT

Page 1 of 1 Pages

MEASUREMENT ITEM : Dose meter
MANUFACTURER : Cirrus Research plc
MODEL/TYPE : CR:110AIS
SERIAL NUMBER : YF477
ID NUMBER : RYG_FS0038
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 : 02 Sep 2025
MEASUREMENT DATE : 04 Sep 2025
ISSUE DATE : 04 Sep 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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

Calibration procedure:

The Noise dosimeter (Unit Under Calibration) was calibrated against Standard dosebadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

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 Cirrus research plc via Certificate number: 248239

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc. Model: RC:110A Serial number: 81051

Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:

Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level ¹ (dB)	Noise Dosimeter reading ² (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ The decibel level of standard doseBadge reader that supplied to Unit Under Calibration.

² The measurement reading of Unit Under Calibration.



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CALIBRATION 0367

Acoustic calibration laboratory
Calibration services department.

REVIEW BY *Supt S*

APPROVED BY *[Signature]*

NEXT CAL DATE 03/ 09/ 2026

Calibration report Number

CDM-040-68

CALIBRATION REPORT

Page 1 of 1 Pages

MEASUREMENT ITEM : Dose meter
MANUFACTURER : Cirrus Research plc
MODEL/TYPE : CR:110AIS
SERIAL NUMBER : YF472
ID NUMBER : RYG_FS0033
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 : 02 Sep 2025
MEASUREMENT DATE : 04 Sep 2025
ISSUE DATE : 04 Sep 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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

Calibration procedure:

The Noise dosimeter (Unit Under Calibration) was calibrated against Standard dosebadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

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 Cirrus research plc via Certificate number: 248239

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc. Model: RC:110A Serial number: 81051

Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:

Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level ¹ (dB)	Noise Dosimeter reading ² (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ The decibel level of standard doseBadge reader that supplied to Unit Under Calibration.

² The measurement reading of Unit Under Calibration.



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CALIBRATION 0367

Acoustic calibration laboratory
Calibration services department.

REVIEW BY Supt S

APPROVED BY [Signature]

NEXT CAL DATE 03/ 09/ 2026

Calibration report Number

CDM-041-68

CALIBRATION REPORT

Page 1 of 1 Pages

MEASUREMENT ITEM : Dose meter
MANUFACTURER : Cirrus Research plc
MODEL/TYPE : CR:110AIS
SERIAL NUMBER : YF473
ID NUMBER : RYG_FS0034
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 : 02 Sep 2025
MEASUREMENT DATE : 04 Sep 2025
ISSUE DATE : 04 Sep 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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

Calibration procedure:

The Noise dosimeter (Unit Under Calibration) was calibrated against Standard dosebadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

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 Cirrus research plc via Certificate number: 248239

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc. Model: RC:110A Serial number: 81051

Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:

Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level ¹ (dB)	Noise Dosimeter reading ² (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ The decibel level of standard doseBadge reader that supplied to Unit Under Calibration.

² The measurement reading of Unit Under Calibration.



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Acoustic calibration laboratory
Calibration services department.

REVIEW BY *Supt S*

APPROVED BY *[Signature]*

NEXT CAL DATE..... 03/ 09/ 2026

Calibration report Number

CDM-048-68

CALIBRATION REPORT

Page 1 of 1 Pages

MEASUREMENT ITEM : Dose meter
MANUFACTURER : Cirrus Research plc
MODEL/TYPE : CR:110AIS
SERIAL NUMBER : YF480
ID NUMBER : RYG_FS0041
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 : 02 Sep 2025
MEASUREMENT DATE : 04 Sep 2025
ISSUE DATE : 04 Sep 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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

Calibration procedure:

The Noise dosimeter (Unit Under Calibration) was calibrated against Standard dosebadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

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 Cirrus research plc via Certificate number: 248239

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc. Model: RC:110A Serial number: 81051

Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:

Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level ¹ (dB)	Noise Dosimeter reading ² (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ The decibel level of standard doseBadge reader that supplied to Unit Under Calibration.

² The measurement reading of Unit Under Calibration.



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Calibration services department.

REVIEW BY Supt S

APPROVED BY [Signature]

NEXT CAL DATE..... 03/ 09/ 2026

Calibration report Number

CDM-042-68

CALIBRATION REPORT

Page 1 of 1 Pages

MEASUREMENT ITEM : Dose meter
MANUFACTURER : Cirrus Research plc
MODEL/TYPE : CR:110AIS
SERIAL NUMBER : YF474
ID NUMBER : RYG_FS0035
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 : 02 Sep 2025
MEASUREMENT DATE : 04 Sep 2025
ISSUE DATE : 04 Sep 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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

Calibration procedure:

The Noise dosimeter (Unit Under Calibration) was calibrated against Standard dosebadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

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 Cirrus research plc via Certificate number: 248239

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc. Model: RC:110A Serial number: 81051

Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:

Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level ¹ (dB)	Noise Dosimeter reading ² (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ The decibel level of standard doseBadge reader that supplied to Unit Under Calibration.

² The measurement reading of Unit Under Calibration.



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CALIBRATION 0367

Acoustic calibration laboratory
Calibration services department.

REVIEW BY *Sapt S*

APPROVED BY *[Signature]*

NEXT CAL DATE 03/ 09/ 2026

Calibration report Number

CDM-046-68

CALIBRATION REPORT

Page 1 of 1 Pages

MEASUREMENT ITEM : Dose meter
MANUFACTURER : Cirrus Research plc
MODEL/TYPE : CR:110AIS
SERIAL NUMBER : YF478
ID NUMBER : RYG_FS0039
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 : 02 Sep 2025
MEASUREMENT DATE : 04 Sep 2025
ISSUE DATE : 04 Sep 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

PRECONDITIONING : The dose meter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

Calibration procedure:

The Noise dosimeter (Unit Under Calibration) was calibrated against Standard dosebadge reader model: RC-110A which the calibration was performed respecting the requirements of ISO/IEC 17025:2017 and carried out in accordance with the requirements of IEC 60942:2003 where applicable.

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 Cirrus research plc via Certificate number: 248239

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader Manufacturer: Cirrus Research plc. Model: RC:110A Serial number: 81051

Remark: doseBadge Reader Unit with Internal Acoustic Calibrator to IEC 60942: 2003 Class 2.

CALIBRATION RESULTS:

Table 1: The results of dose meter calibration are reported in the table below.

DoseBadge Reader Level ¹ (dB)	Noise Dosimeter reading ² (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ The decibel level of standard doseBadge reader that supplied to Unit Under Calibration.

² The measurement reading of Unit Under Calibration.



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



Certificate of Calibration

Cert.No.: 25CH709/1

Page.: 1 of 3

This Certificate was issued to replace the Certificate No.25CH709

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No. : B834291445
ID No. : RYG_EN0152
Condition As-Received: Used Item
Received Date : 12 June 2025
Calibration Date : 18 June 2025
Reference : 2506-0407DSC-2
Submitted by :

REVIEW BY *Photchanas*
APPROVED BY *D. Khun*
NEXT CAL DATE..... **18/12/26**

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

- () Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 1 July 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.



Cert.No.: 25CH709/1

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 7.000	Hach Lenge GmbH	C03232	02 Dec 2026
pH 10.010	CPA chem	1066669	18 Jan 2026

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: B834291445	4.000	177.48	177.3	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	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 ($\pm$)	Coverage factor k
pH Electrode S/N.: 5211504	4.007	4.006	181.1	0.0044	2.00
	7.000	7.000	4.9	0.0084	2.00
	10.010	10.007	-170.6	0.0066	2.00

Function : Temperature Measurement**(*) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : InLabEXpert Pro-ISM
- Serial No. : 5211504

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 ($\pm$ °C)	Coverage factor k
25.0	25.001	25.1	0.099	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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TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 25E1979/1

Page : 1 of 2

This Certificate was issued to replace to the Certificate No. 25E1979

Equipment : pH Meter
Manufacturer: Mettler Toledo
Model : SevenExcellence
Serial No.: B834291445
ID No.: RYG_EN0152
Condition As-Received: Used Item
Received Date: 12 June 2025
Calibration Date: 16 June 2025
Reference: 2506-0407DSC
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: *ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch*

*616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand*

Procedure used: Calibration were conducted using calibration procedure No. CP-E17 According to EURAMET cg-15.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Multi-Product Calibrator	5500A	6315011	25E1627	19 May 2026

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

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

4.This measurement result is traceable to the International System of Unit maintained through:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Wutchareeporn Peethong
Issue Date : 01 July 2025

Approved Signatory : _____

[] Phalinee Prabpaipal

[✓] Nuntawat Khamchai

[] Pongsagorn Boonyaporn



Cert. No.: 25E1979/1

Page.: 2 of 2

Result of calibration :- (*) Without adjustment () After adjustment

Function: DC voltage measurement

Range: 2000 mV

<u>Standard Value</u>	<u>UUC* Reading</u>	<u>Error</u>	<u>Uncertainty</u>
(mV)	(mV)	(mV)	($\pm$ μ V)
-200.0000	-199.9	0.1	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	50.0	0.0	61
100.0000	100.0	0.0	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-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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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

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%

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.

REVIEW BY Photchana S.

APPROVED BY D. Chuan

NEXT CAL DATE 20/07/26



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2501-0600DSC-2

Cert. No.: 25LM10

Page.: 2 of 2

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:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Digital Thermometer	2188080	2411022	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

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
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)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

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

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

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



Cert.No.: 25TW15

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
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)
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



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 :

Kunchit

Approved Signatory

() 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
Page : 2 of 3

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:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
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 :

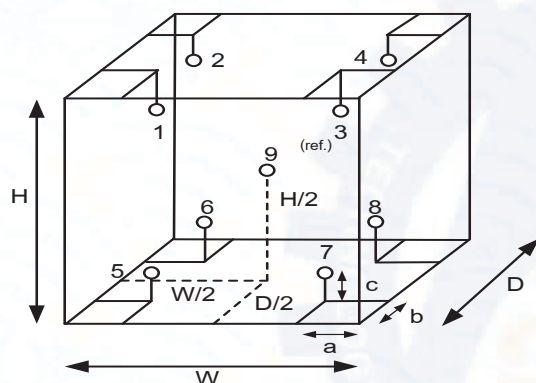
Remark : TPA : Technology Promotion Association (Thailand - Japan)

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
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 26TM461

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
20.0	20.0	20.0	0.019	0.19	0.34	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
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

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.



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.

บริษัท ดีเคเอส อีเซีย จำกัด

DKSH Technology Limited

2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 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
637.98	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
	1.0083	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
	0.9468	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

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

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00064379

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
18 Mar 2025			18 Mar 2025		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		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. อิเล็กโทรด (Electrode and Connection Cable)	☐	☐	
☐	☐	13. ระดับสารละลายใน Electrode (Level KCl)	☐	☐	
☐	☐	14. ฝาปิดกันเปลาย Electrode (Dust Protection Hood)	☐	☐	
☐	☐	15. ขาจับอิเล็กโทรด (Stand)	☐	☐	
		Turbidimeter			
☐	☐	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	☐	☐	
☐	☐	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	☐	☐	
		Automatic titrator			
☐	☐	18. สภาพ Piston Burettes	☐	☐	
☐	☐	19. Function Rinsing and Dosing	☐	☐	
☐	☐	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	☐	☐	

เพิ่มเติม/ข้อแนะนำ : * 656.1nm = 656.1nm

* 486.0nm = 485.7nm

Mr.Preecha Phooarsai

Service Engineer

Accredited by

NSC-TISI-TIS 17025

Calibration 0426



Calibration certificate

Calibration Certificate No. 26BCI0064

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	MCE224S-2S00-U	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.	38101399 RYG_EN0163	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	REVIEW BY <i>Thanitak</i>
Number of pages	4	APPROVED BY <i>D. Inthana</i>
Date of calibration	03 Feb 2026	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	03 Feb 2026	Approval of the Calibration Certificate	Person in charge
		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.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. <i>T</i> _{weights} - <i>T</i> _{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
	<i>s</i> = 0.00004 g	<i>s</i> = 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 $ \Delta_{ecc} _{max} = 0.0001\text{ g}$	

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> (<i>E</i>)	<i>U</i> _{rel} (<i>E</i>)
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	0.00018 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		$ E _{max} = 0.0001\text{ 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	$1 \cdot 10^{-6}/\text{K}$

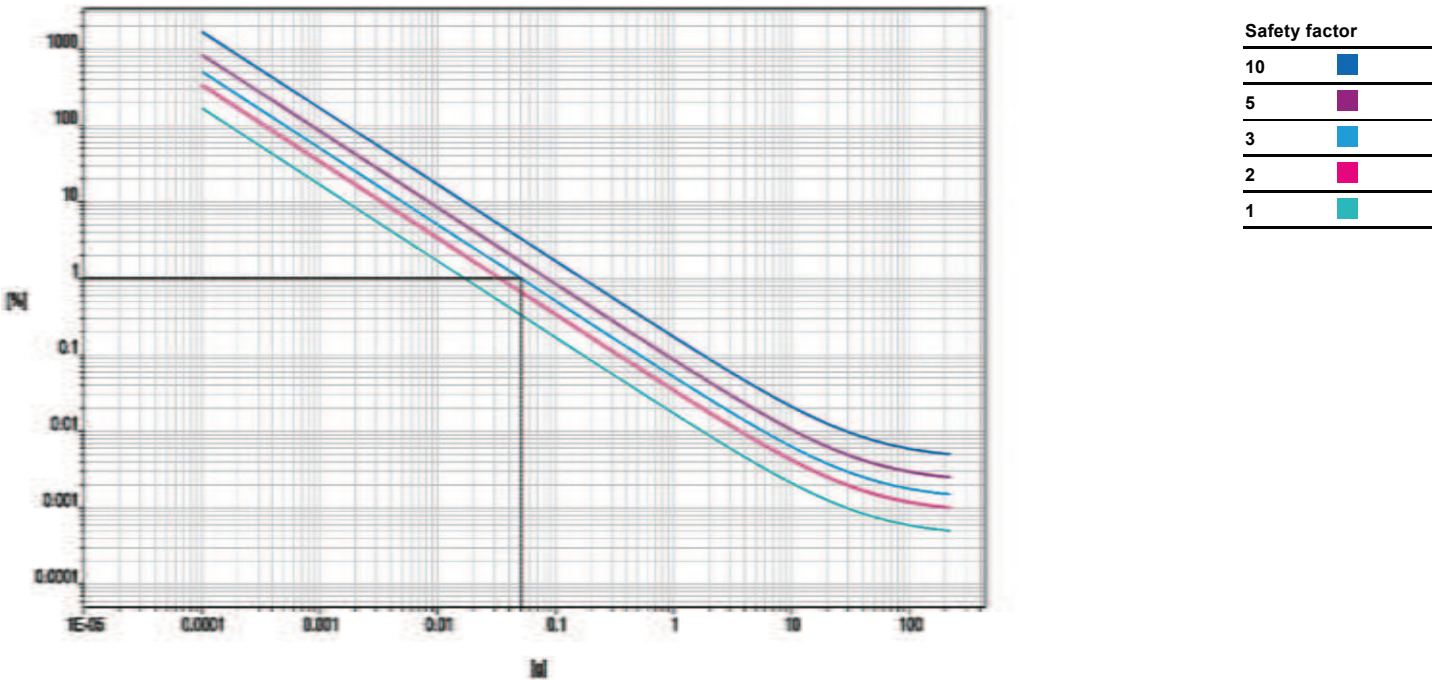
Uncertainty of the weighing result $U_{gl}(W)$

$U_{gl}(W) = 0.00017 \text{ g} + 4.25 \cdot 10^{-6} \cdot R$

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



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 No. T251530

Page 1 of 3

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 Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 17 SEP 2025



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. T251530

Page 2 of 3

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 ☒ Open ☒ Min ☐ Medium ☐ Max

☐ Close

☐ Not Available

5. Adjustment :

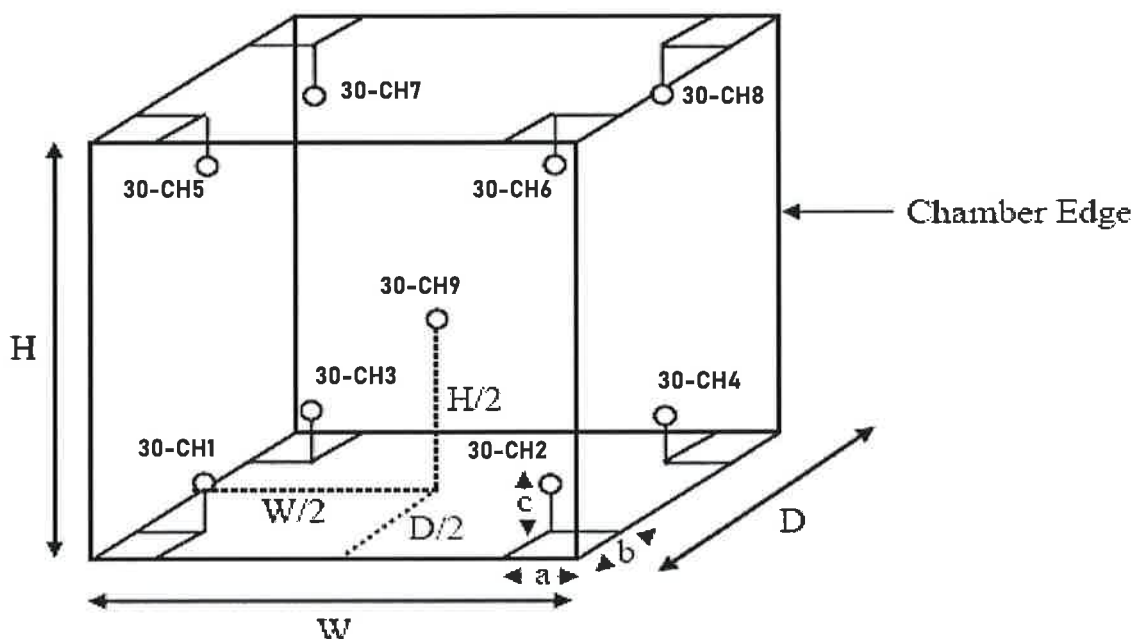
() without adjustment

(X) after adjustment

Approved By. _____



Calibration Report



Remark : Internal Dimensions of Chamber : W (Width) = 56 cm. , H (Height) = 48 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 = 48 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	104.00	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. _____





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 No. T252169

Page 1 of 3

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

REVIEW BY	Thavitall.
APPROVED BY	
NEXT CAL. DATE	27/11/26

The uncertainties are for a confidence probability of approximately 95%.

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Certificate No. T252169

Page 2 of 3

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

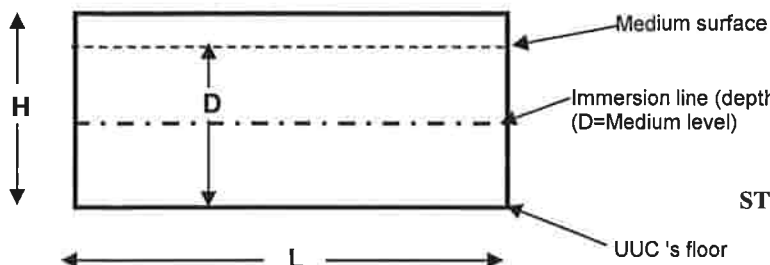
Approved By. _____

Certificate No. T252169

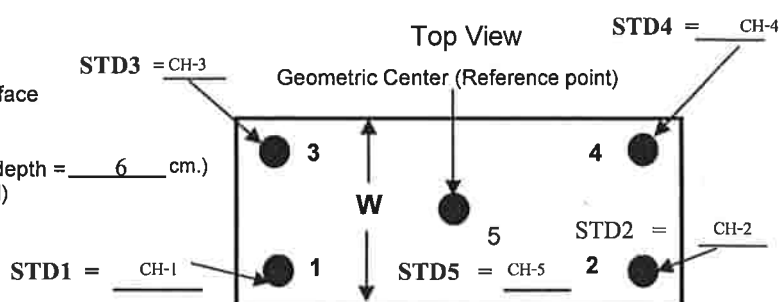
Page 3 of 3

Calibration Report

Side View



Top View



● 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 corner and walls.

Measurement Results:

Calibration Point	Average Standard Reading at each position (° C)				
	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 (° C)	Stability (± ° C)	Uniformity (± ° C)	Uncertainty (± ° C)	Coverage Factor <i>k</i>
	Min , Max	Average					
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. 



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



Certificate of Calibration

Cert.No.: 25CH458

Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C221115514
ID No. : RYG_FS0596
Condition As-Received: Used Item
Received Date : 24 June 2025
Calibration Date : 25 June 2025
Reference : 2506-0782DSC-4
Submitted by :

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 Paipim
(✓) Saithip Meangmai

Issue Date : 26 June 2025

REVIEW BY *Pitthaya T.*
APPROVED BY *Saithip S.*
NEXT CAL DATE *25/06/26*

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.



Cert.No.: 25CH458

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

- This measurement result is traceable to SI through 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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1114385	08 June 2026

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: C221115514	4.00	177.48	178	4.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00



Cert.No.: 25CH458

Page.: 3 of 3

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 ($\pm$)	Coverage factor k
pH Electrode S/N.: 3293232	4.007	4.01	163	0.0079	2.00
	6.965	6.99	-10	0.011	2.00
	10.010	10.00	-185	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Go-ISM

- Serial No. : 3293232

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 ($\pm$ °C)	Coverage factor k
25.0	25.002	25.1	0.098	0.13	2.00
45.0	45.001	45.2	0.199	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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Certificate No. T252167

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cold Room)

Manufacturer : MODULAR

Model : IREVCOHCOO

Serial No. : C00351459

Customer Code : RYG_EN0184

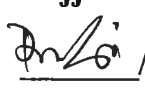
ID No. : T1939A5

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



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. T252167

Page 2 of 4

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

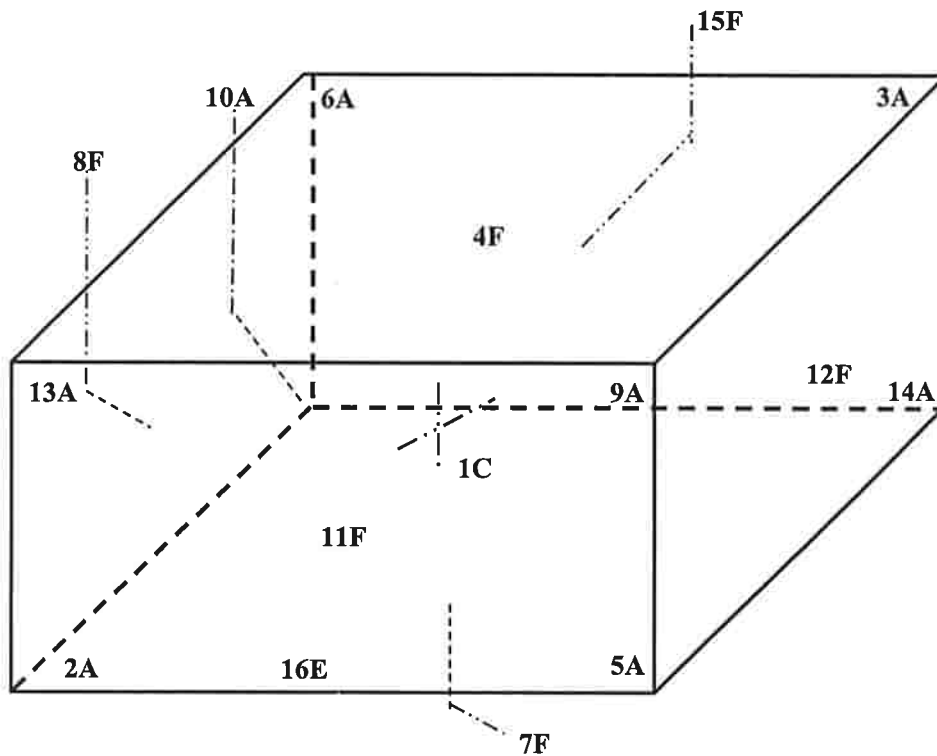
(X) after adjustment

Approved By. 

Certificate No. T252167

Page 3 of 4

Calibration Report



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C	=	TN161
2A	=	TN162
3A	=	TN163
4F	=	TN164
5A	=	TN165
6A	=	TN166
7F	=	TN167
8F	=	TN168
9A	=	TN169
10A	=	TN170

11F	=	TN171
12F	=	TN172
13A	=	TN173
14A	=	TN174
15F	=	TN175
16E	=	TN176

Approved By. _____



Certificate No. T252167

Page 4 of 4

Calibration Report

Measurement Results:

Average Standard Reading at each position (°C)										
Calibration Point	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 <i>k</i>
	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. Don Lal