

ภาคผนวก ง

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ใบรับรองการสอบเทียบเครื่องมือ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG_FS0457	3-Jul-25	3-Jan-26	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG_FS0533	3-Jul-25	3-Jan-26	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG_FS0551	3-Jul-25	3-Jan-26	6
Ambient	Non-Methane Hydrocarbon	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Ambient	Non-Methane Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Ambient	Non-Methane Hydrocarbon	Total Hydrocarbon Analyzer	RYG_EN0038	6-Mar-25	6-Mar-26	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0725	17-Sep-24	17-Mar-26	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0496	19-Mar-25	19-Mar-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0300	26-Aug-25	25-Aug-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0434	27-Jan-25	26-Jan-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0619	21-Jan-25	21-Jan-26	12
Noise	Leq 12 hrs	Sound Calibrator	RYG_FS0213	16-Jan-25	16-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0018	21-Jan-25	21-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0019	21-Jan-25	21-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0020	21-Jan-25	21-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0022	19-Mar-25	19-Mar-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0389	27-Jan-25	26-Jan-26	12
Noise	Leq 12 hrs	Sound Calibrator	RYG_FS0213	16-Jan-25	16-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0020	21-Jan-25	21-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0617	21-Jan-25	21-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0618	21-Jan-25	20-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0620	27-Jan-25	26-Jan-26	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0621	27-Jan-25	26-Jan-26	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0210	12-Feb-25	11-Feb-26	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0055	28-Apr-25	27-Apr-26	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0635	26-May-25	25-May-26	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0636	19-Sep-25	18-Sep-26	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0210	12-Feb-25	11-Feb-26	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0587	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0210	12-Feb-25	11-Feb-26	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0036	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0037	4-Sep-25	3-Sep-26	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0212	17-Sep-25	16-Sep-26	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0583	16-Sep-24	16-Sep-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0521	17-Mar-25	16-Mar-26	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0522	17-Mar-25	16-Mar-26	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0218	27-Jan-25	26-Jan-26	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0219	9-Apr-25	8-Apr-26	12
Workplace	n-Hexane	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace	n-Hexane	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	n-Hexane	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	n-Hexane	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Workplace	Total Dust	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Total Dust	Digital Balance	RYG_EN0004	20-Feb-25	20-Feb-26	12
Workplace	1-Butene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace	1-Butene	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	1-Butene	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Ethylene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace	Ethylene	DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace	Ethylene	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Rayong Lab	pH at 25 °C	pH meter	RYG_EN0183	18-Jul-25	18-Jan-27	18
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	20-Jan-25	20-Jul-26	18
Rayong Lab	BOD	Incubator	RYG_EN0154	1-Nov-24	1-May-26	18
Rayong Lab	BOD	Burette	RYG_EN0216	18-Sep-25	18-Sep-26	12





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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

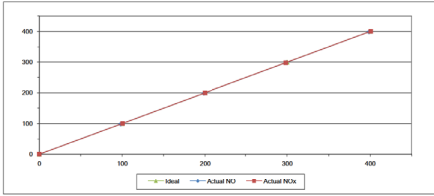
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0163	20-Feb-25	20-Feb-26	12
Rayong Lab	Total Suspended Solids	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0163	20-Feb-25	20-Feb-26	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	20-Feb-25	20-Feb-26	12
Rayong Lab	Oil & Grease	Liquid Bath (Water)	RYG_EN0220	27-Nov-25	27-Nov-26	12
Rayong Lab	Color (at Original pH)	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Color (at pH 7.0)	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Temperature	pH meter	RYG_FS0425	20-May-25	20-May-26	12
Rayong Lab	Dissolved Oxygen	Chamber (Cold Room)	RYG_EN0184	27-Nov-25	27-May-27	18
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Water Lab	n-Hexane	Gas Chromatography (MSD)	BKK_EN0059	25-Jun-25	25-Dec-26	18
Water Lab	TPH C <sub>5</sub> -C <sub>8</sub>	Gas Chromatography (MSD)	BKK_EN0059	25-Jun-25	25-Dec-26	18
Water Lab	TPH C <sub>8</sub> -C <sub>16</sub>	Gas Chromatography (FID)	BKK_EN0411	9-May-25	9-May-26	12
Water Lab	TPH C <sub>16</sub> -C <sub>35</sub>	Gas Chromatography (FID)	BKK_EN0411	9-May-25	9-May-26	12
Soil	pH aqueous phase 50% (w/v)	pH Meter	RYG_EN0152	18-Jun-25	18-Dec-26	18
Soil	n-Hexane	Gas Chromatography (MSD)	BKK_EN0059	25-Jun-25	25-Dec-26	18
Soil	TPH C <sub>5</sub> -C <sub>8</sub>	Gas Chromatography (MSD)	BKK_EN0059	25-Jun-25	25-Dec-26	18
Soil	TPH C <sub>8</sub> -C <sub>16</sub>	Gas Chromatography (FID)	BKK_EN0411	9-May-25	9-May-26	12
Soil	TPH C <sub>16</sub> -C <sub>35</sub>	Gas Chromatography (FID)	BKK_EN0411	9-May-25	9-May-26	12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jul-25	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	TZT8VRL	Equipment ID	RYG_FS0551
Calibrator/Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	66.89	Cylinder No.	GH0037233
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

CALIBRATION RESULTS							
Point	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	98.30	-1.70	-1.70	100.30	0.30	0.30
2	200.00	198.40	-1.60	-0.80	199.80	-0.20	-0.10
3	300.00	298.70	-1.30	-0.43	298.50	-1.50	-0.50
4	400.00	398.00	-1.40	-0.35	400.80	0.80	0.13
AVERAGE (%)				-0.64			-0.01



Calibrated By

Approved By

(Mr. Jirawat Sakum)  
Field Environmental Scientist (3)

(Mr. Saraph Jittront)  
Assistant General Manager

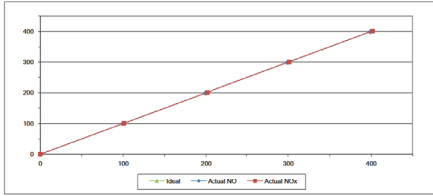
ALS Laboratory Group  
FORM NO. I-06-056 REVISION NO. - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jul-25	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	7238	Equipment ID	RYG_FS0533
Calibrator/Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	66.89	Cylinder No.	GH0037233
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

CALIBRATION RESULTS							
Point	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	99.50	-0.50	-0.50	101.10	1.10	1.10
2	200.00	198.90	-1.10	-0.55	201.20	1.20	0.60
3	300.00	298.80	-1.20	-0.40	301.00	1.00	0.33
4	400.00	398.70	-1.30	-0.33	401.80	1.80	0.45
AVERAGE (%)				-0.33			0.50



Calibrated By

Approved By

(Mr. Jirawat Sakum)  
Field Environmental Scientist (3)

(Mr. Saraph Jittront)  
Assistant General Manager

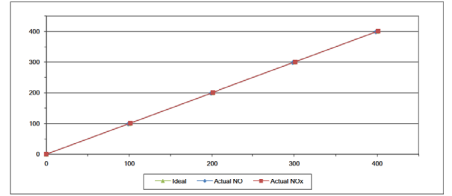
ALS Laboratory Group  
FORM NO. I-06-056 REVISION NO. - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jul-25	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	UBADEAGK	Equipment ID	RYG_FS0551
Calibrator/Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	66.89	Cylinder No.	GH0037233
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

CALIBRATION RESULTS							
Point	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	198.70	-1.30	-0.65	201.00	1.00	0.50
3	300.00	298.40	-1.60	-0.53	301.20	1.20	0.40
4	400.00	398.50	-1.50	-0.38	401.30	1.30	0.33
AVERAGE (%)				-0.48			0.52



Calibrated By

Approved By

(Mr. Jirawat Sakum)  
Field Environmental Scientist (3)

(Mr. Saraph Jittront)  
Assistant General Manager

ALS Laboratory Group  
FORM NO. I-06-056 REVISION NO. - ISSUE DATE: 02/04/12

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTHEASAKORN 11 TAMBON BANG KARD,  
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10141 THAILAND  
TEL: 080-210-5881 FAX: 080-210-5748



### Certificate of Calibration

Certificate No : 25-AFM-023

Request No : Req 2025-0169

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

#### Unit Under Calibration Details

Measurement Item : Air Flow Meter  
Manufacturer : Mesa Labs  
Model : 200-510E  
Serial Number : L30027  
ID : RYG\_FS0208

Location of Calibration : LAB 4 AIR VELOCITY MITER

#### Calibration Environment and Details

Temperature : 23 °C ± 0.3 °C  
Humidity : 55 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 0.1 hPa  
Received Date : 21 January 2025  
Calibration Date : 27 January 2025  
Calibration Procedure : In house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Date Calibration
Air Flow Meter	Gilibrator 3 Low flow	15031011003	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qtechem	1 March 2025
Pressure meter	CPQ2400	4300082U651882	TPA	21 October 2025

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

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

Calibration By : Mr. Noppon Luangmit  
Service Calibration Engineer

Approved By : Mr. Pait Mahavorn  
Calibration Engineer Supervisor

Issue Date : 27 January 2025

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

FM 708 AFM 01 Rev 01 Issue Date 8/26/24

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTHEASAKORN 11 TAMBON BANG KARD,  
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10141 THAILAND  
TEL: 080-210-5881 FAX: 080-210-5748



### Certificate No : 25-AFM-023

Request No : Req 2025-0169

#### Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (hPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.50	100.90	20	19.554	0.1	1.5	0.2	Pass
22.50	100.90	30	29.712	0.3	1.5	0.5	Pass
22.60	100.90	101	100.77	-0.2	2.8	1.0	Pass
22.70	100.90	151	150.23	-0.8	4.2	1.5	Pass
22.70	100.90	201	200.39	0.6	5.6	2.0	Pass
22.70	100.90	301	300.49	0.3	8.4	3.0	Pass
22.80	100.90	400	402.96	2.0	11	4.0	Pass
23.10	100.90	500	504.62	4.6	7.2	5.0	Pass

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

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

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

\* Indicates non accredited  
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)  
NA = Not Available, Customer does not require a statement of conformity.

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

FM 708 AFM 01 Rev 01 Issue Date 8/26/24

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTHEASAKORN 11 TAMBON BANG KARD,  
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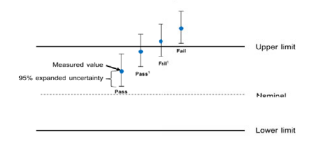
### Certificate No : 25-AFM-023

Request No : Req 2025-0169

#### Decision Rule for Statements of Conformity

The standard decision rule employed for the statement of conformity to each calibration result will be applied using ILAC G8:09/2019, Guidelines on the Reporting of Compliance with Specifications as follows (Fig. and statement):

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability was within the limit.  
Fail = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.  
Fail = The measurement result was outside 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 was outside the limit.



End of Certificate

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

FM 708 AFM 01 Rev 01 Issue Date 8/26/24

INNOVATIVE INSTRUMENT CALIBRATION LAB  
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AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10141 THAILAND  
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### Certificate of Calibration

Certificate No : 25-AFM-208

Request No : Req 2025-1986

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

#### Unit Under Calibration Details

Measurement Item : Air Flow Meter  
Manufacturer : Mesa Labs  
Model : 200-510E  
Serial Number : 151114  
ID : BICK\_FS0614

Location of Calibration : LAB 4 AIR VELOCITY MITER

#### Calibration Environment and Details

Temperature : 23 °C ± 0.3 °C  
Humidity : 55 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 0.1 hPa  
Received Date : 3 September 2025  
Calibration Date : 10 September 2025  
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Date Calibration
Air Flow Meter	Gilibrator 3 Low flow	15031011006	Sensidyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	6 May 2026
Temperature meter	GT 11	08000057	Qtechem	15 October 2025
Pressure meter	CPQ2400	4300082U651882	TPA	21 October 2025

Traceability : This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01 and MIT NSC-TIS-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. Noppon Luangmit  
Service Calibration Engineer

Approved By : Mr. Pait Mahavorn  
Calibration Engineer Supervisor

Issue Date : 10 September 2025

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

FM 708 AFM-01 Rev 06 Issue Date 11/21/25

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7139 MOO 13, SOI SUTHEASAKORN 11 TAMBON BANG KARD,  
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10141 THAILAND  
TEL: 080-210-5881 FAX: 080-210-5748



### Certificate No : 25-AFM-208

Request No : Req 2025-1986

#### Result of Calibration : Without Adjustment

STD Reading				UUC Reading				Error	Uncertainty	
Temperature (°C)	Pressure (hPa)	Flow (cc/min)	Flow (scfm)	Temperature (°C)	Pressure (hPa)	Flow (cc/min)	Flow (scfm)		Error (cc/min)	Uncertainty (cc/min)
22.5	100.96	100	-	-	100.02	0.0	3.6	1.0	0.50	
22.7	100.97	303	-	-	300.81	-2.2	9.5	1.0	0.50	
22.8	100.99	1003	-	-	1000.4	-2	19	1.0	0.50	
26.1	100.98	2000	-	-	2001.9	2	36	1.0	0.50	
26.5	100.85	3014	-	-	3002.2	-12	57	1.0	0.50	
26.7	100.81	4027	-	-	4009.0	-26	76	1.0	0.50	
27.0	100.74	5040	-	-	5001.8	-38	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 :

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

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

\* Indicates non accredited

End of Certificate

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

FM 708 AFM 01 Rev 06 Issue Date 11/21/25

TEST REPORT

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอส กรุ๊ป (ไทยแลนด์) จำกัด)  
EQUIPMENT NAME : THIC Analyzer  
MANUFACTURER : HORIBA MODEL : APNA-370 SERIAL NO : U430GTHB  
STANDARD GAS CONCENTRATION (PPM) (CH4) : 506.1 PPM CYLINDER NO : CC734373  
CYLINDER PRESSURE (psig) : 1,600 PSI CERTIFIED DATE : 12/05/2020  
CERTIFIED BY : AIRGAS EXPIRED DATE : 12/05/2028

TEST RESULTS

POINT NO	IDEAL	ACTUAL CH	ERROR CH	MEASUREMENT CH	ACTUAL THIC	ERROR THIC	MEASUREMENT THIC
ZERO	0.00	0.00	0.00	-	0.00	0.00	-
1	10.00	10.05	0.05	0.50	10.05	0.05	0.50
2	20.00	20.10	0.10	0.50	20.12	0.12	0.60
3	30.00	30.29	0.29	0.97	30.27	0.27	0.90
4	40.00	40.01	0.01	0.02	40.02	0.02	0.05
AVERAGE (%)				0.50			0.51

REVIEW BY : [Signature]  
APPROVED BY : [Signature]  
NEXT CAL DATE : 6/5/2026

CALIBRATED BY : [Signature]  
CHECKED BY : [Signature]  
DATE : 6/5/26

Address: 115/15, 15/25-36 Moo 1, Bang Khen Subdistrict, Bang Khen District, Bangkok 10140, Thailand  
Tel: 02-868-0812 ~ 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231

CHECK LIST

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co., Ltd (บริษัท แอลเอส กรุ๊ป จำกัด (มหาชน))

EQUIPMENT NAME : The Analyzer

MANUFACTURER : HORIBA MODEL : APHA-370 SERIAL NO. : 14355THB

TEST VALUES

NO.	THC Analyzer (APHA - 370)	UNIT	BEFORE	AFTER
1	Signal (CH4)	mV	35.50	35.40
2	Signal (THC)	mV	36.60	36.10
3	Detector	Pressure kPa, Standard Value: Ambient temp(20°C)Co(20°C)	45.20	45.80
4	Ambient	kPa, Standard Value: Ambient temp(20°C)Co(20°C)	45.20	45.80
5	Puffette	mV, Standard Value: 390 V to 430 V	419.90	419.80
6	NMI-K	kPa, Normal value : 8 kPa to 25 kPa	9.70	9.70
7	DC 24 V	V, Standard Value: 230 V to 260 V	244.00	244.10
8	DC 24 V	V, Standard Value: 24 V ± 0.5 V	23.90	23.90
9	Input (Optional)	L/min, Normal value : 0.9 L/min ± 0.3 L/min	5.00	5.00
10	Over Flow (Optional)	L/min, Standard Value: 0.8 L/min or More	-	-
11	CH4 Sampling Reading	PPM	2.08	2.07
12	NMI-K Sampling Reading	PPM	0.06	0.75
13	THC Sampling Reading	PPM	2.14	2.82
14	Zero Gas CH4/THC	PPM	0.02/0.02	0.00/0.00
15	Span Gas	PPM	39.60/39.70	40.01/40.02
16	Span H2	PPM	-	-

Remark: Reference: EX-EN-017-56, Ambient HC Monitor APHA-370 Operation Manual Page 881

Remark: (Ambient temperature = 20°C to 40°C)

บริการที่ตรวจวัด


Service Maintenance


รายละเอียดการให้บริการ

บริการ Service Maintenance, ทำ Calibration Zero/Span, MultiPoint

ผลการตรวจวัด

ตรวจวัด เครื่องวิเคราะห์ก๊าซคาร์บอนไดออกไซด์

CALIBRATED BY :  DATE : 6/13/49

CHECKED BY :  DATE : 6/13/49

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CERTIFICATE OF CALIBRATION

MANUFACTURER: JIRANATEE ASSOCIATES CO., LTD.

Accredited calibration laboratory ISO/IEC 17025:2017 NAC-TSI-TS 17025 CALIBRATION 0367

MANUFACTURER: HORIBA MODEL: APHA-370 SERIAL NO: 14355THB

CONDUCTED AS RECEIVED CUSTOMER

RECEIVED DATE: 12 Sep 2024

MEASUREMENT DATE: 12 Sep 2024

ISSUE DATE: 01 Oct 2024

ENVIRONMENTAL CONDITIONS: Ambient condition in the laboratory are as follows: Temperature: 23.9 ± 0.5 °C, Relative humidity: 55.0 ± 15.0 %RH, Atmospheric Pressure: 1009.10 hPa

PLACE OF CALIBRATION: Effluent type wind tunnel of Jirananee Associates Co., Ltd.

CALIBRATION CONDITIONS: Wind tunnel cross-section area: 900 cm², Wind direction (upright): 100 cm, Diameter of emitting pipe: 125 mm, Blockage ratio of test object: 0.343

Preconditioning: 24 hours at ambient conditions.

Measurement Condition: 24 hours at ambient conditions.

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

Calibrated by:  DATE: 6/13/49

CHECKED BY:  DATE: 6/13/49

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ตรวจวัด เครื่องวิเคราะห์ก๊าซคาร์บอนไดออกไซด์



IRANATEE ASSOCIATES CO., LTD.
Accredited calibration laboratory
ISO/IEC 17025:2017
NAC-TSI-TS 17025
CALIBRATION 0367
Pressure measurement laboratory
Calibration services department.
CERTIFICATE OF CALIBRATION
Certificate No. : CPE-009-07
Page 1 of 2 Pages
MEASUREMENT ITEM : Digital barometer
MANUFACTURER : Novaya
MODEL/TYPE : Sensor: 112-AVS-250P
Data logger: 110-QS-250L-0
SERIAL NUMBER : Sensor: SP-A0070
Data logger: A0070
ID NUMBER : RYG\_150225
CONDITION AS-RECEIVED : RYG Item
CUSTOMER : J&S Laboratory group (Thailand) Co., Ltd.
104 Phatthanakan Rd., Phatthanakan Rd.,
Bangkok 10256 Thailand,
RECEIVED DATE : 12 Sep 2024
MEASUREMENT DATE : 25 Sep 2024
ISSUE DATE : 29 Sep 2024
CONCLUSION OF THE RESULT OF CALIBRATION
1. Reference Standard Instrument:
Instrument: Model: Certificate No.: Due Date:
Serial No.:
2. Calibration after the calibration sequence C
3. The UDC\* was used in vertical orientation above reference standard instrument and enter of UDC\* was used as the reference level
4. Calibration conditions:
a. Conditions:
Pressure transmitting medium: Air
Pressure: 101.3 kPa
Relative humidity: 50%
Temperature: 23.0 °C
5. The certificate is valid within the calibration period on date and place of calibration
Approved signature: Mr. Parinya Boonchuan
Calibration Engineer Supervisor
THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

IRANATEE ASSOCIATES CO., LTD.
Accredited calibration laboratory
ISO/IEC 17025:2017
NAC-TSI-TS 17025
CALIBRATION 0367
Pressure measurement laboratory
Calibration services department.
CERTIFICATE OF CALIBRATION
Certificate No. : CPE-009-07
Page 2 of 2 Pages
MEASUREMENT RESULTS : Without adjustment
CALIBRATION IN THE RANGE OF : 950 mbar to 1050 mbar
The results of calibration and associated measurement uncertainties are reported in the table below.
Table with 4 columns: Parameter, Uncertainty (kPa), Bias (mbar), and Acceptance Limit (mbar)
Note: UDC\* Unit Under Calibration
\*End of certificate
Approved signature: Mr. Parinya Boonchuan
Calibration Engineer Supervisor
THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/19 MOO 13, SOI SINTANAKORN 11 TAMBON BANG KHAO,
AMPHOE BANG PHEI SAMUT PRAKAN PROVINCE 10640 THAILAND
TEL: 0800-2150-9001 FAX: 0800-2150-7140
Page 1 of 3
Certificate of Calibration
Customer : ALS Laboratory Group Thailand Co., Ltd.
Name : 104 Soi Phatthanakan 40, Phatthanakan Road, Sum Luang,
Bangkok 10250
Certificate No. : 25-ACT-042
Request No. : Req-2025-0604
Unit Under Calibration Details
Measurement item : Acoustic Calibrator
Class : I
Manufacturer : RION
Range : 94 dB / 1000 Hz
Model : NC-75
Instrument Status : Used
Serial Number : 338002736
ID : RYG\_FS0300
Calibration Environment and Details
Temperature : (23.0 ± 0.2) °C
Humidity : (50 ± 20) %RH
Barometric Pressure : (1013 ± 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
Reference Standard Model Serial Number Traceable Due Calibration
Sound Calibrator SV 35A 98079 EEI 12 June 2025
TSD Multimeter 2015 1647765 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 Luangrat
Service Calibration Engineer
Approved By : Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 19 March 2025
The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.
(Pat 108-ACT-02 Rev.03 Issue date 5/02/24)

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/19 MOO 13, SOI SINTANAKORN 11 TAMBON BANG KHAO,
AMPHOE BANG PHEI SAMUT PRAKAN PROVINCE 10640 THAILAND
TEL: 0800-2150-9001 FAX: 0800-2150-7140
Page 1 of 3
Certificate No. : 25-ACT-042
Request No. : Req-2025-0604
Sound pressure level
Calibration Results : Without Adjustment
Table with 5 columns: Calibration Range, Measured, Deviated, Measured, Deviated, Uncertainty, Acceptance limit, Result
Frequency of Sound pressure level
Table with 5 columns: Calibration Range, Measured, Deviated, Measured, Deviated, Uncertainty, Acceptance limit, Result
Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)
Table with 5 columns: Calibration Range, Measured, Deviated, Measured, Deviated, Uncertainty, Acceptance limit, Result
Note :
- Acceptance limit was IEC 60812:2017 Class 1
- The calibration results include the calibration pressure correction
- The calibration results include the microphone volume correction
THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/19 MOO 13, SOI SINTANAKORN 11 TAMBON BANG KHAO,
AMPHOE BANG PHEI SAMUT PRAKAN PROVINCE 10640 THAILAND
TEL: 0800-2150-9001 FAX: 0800-2150-7140
Page 1 of 3
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 such calibration result will be applied using IEC 60812:2017. Guidelines on the Reporting of Compliance with Specifications as follows:
Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.
Fail - The measurement result was outside the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.
Fail - The measurement result was outside 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
THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY
400/401 Srinakharin Road, Bangna Suburb, Bangkok, 10700 Thailand
Tel: +662 8331 8331 Email: calibration@sithiporn.com
Page 1 of 3
SITHIPORN ASSOCIATES CALIBRATION LABORATORY
Cert. No. : ACL25337
Page : 1 of 8
Calibration Certificate
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00572561 / 170398 / 72899
ID No.: RYG\_FS0300
Condition As Found : GOOD
Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10256 THAILAND.
Location : -
Ambient Temperature : ( 23.0 ± 3 ) °C
Pressure : ( 101.3 ± 3 ) kPa
Relative Humidity : ( 50.0 ± 20 ) %
Received Date : 07 AUGUST 2025
Calibration Date : 26 AUGUST 2025
Date of Issue : 27 AUGUST 2025
Calibrated by : Nathakorn Pitsupapian
Approved by : Wichok Ekpongpradit
( 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.

SITHIPORN ASSOCIATES CALIBRATION LABORATORY
Cert. No. : ACL25337
Job No. : VC68AC0168
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 test results of each item 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 MY52201762 EF-0012-25 11-FEB-26
Digital Multimeter 33461A MY53220104 EEL-BP-2403068 25-APR-26
Digital Multimeter 33461A MY53220076 EEL-BP-2403068 25-APR-26
Digital Multimeter 34461A MY60024273 CA2025120EA 18-MAR-26
Programmable Attenuator MAT-1079 62100114 EF-0006-25 11-FEB-26
Condenser Microphone 4180 2977900 AA-1002-25 19-FEB-26
Measuring Amplifier NA-42KA 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).

SITHIPORN ASSOCIATES CALIBRATION LABORATORY
Cert. No. : ACL25337
Job No. : VC68AC0168
Pages : 3 of 8
Summary of Measurement Result :
Table with 3 columns: 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 0.6
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 0.1
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

SITHIPORN ASSOCIATES CALIBRATION LABORATORY
Cert. No. : ACL25337
Job No. : VC68AC0168
Page : 4 of 8
Result of calibration :
1. Absolute sensitivity
Table with 4 columns: 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.
Table with 2 columns: Frequency Weighting, Weighting (dB)
A-weight 15.4
C-weight 21.3
Flat 27.0
3. Acoustical signal tests of frequency weightings
Meter free-field acoustic response at a level of 94 dB
Table with 4 columns: Frequency (Hz), Deviation from various frequency weightings response curve (dB), Acceptance Limits
125 0.4 0.4 0.4 ±1.5
1000 0.0 0.0 0.0 ±1.0
8000 1.9 2.0 2.0 ±5.0

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Job No. : VC68AC0168  
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	-0.1	±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

SITHIPORN

Cert. No. : ACL25337  
Job No. : VC68AC0168  
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	27.1	0.1	±1.1
26.0	26.0	0.0	±1.1
25.0	25.0	0.0	±1.1

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Cert. No. : ACL25337  
Job No. : VC68AC0168  
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	94.1	0.1	±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
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	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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Cert. No. : ACL25337  
Job No. : VC68AC0168  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	89.5	±1.5
Negative one-half cycle	89.5	±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

401-401/3 Sathorn Road, Bangkok, Bangkok, 10120 Thailand  
Tel : +66 2433 8838 Email : calibration@sithiporn.com

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NI-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00296517 / 135220 / 87527  
ID No. : RYG JS0434

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, 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 : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

Calibrated by : Nithakorn Pitsupaisan

Approved by :

T. Petchu  
( Thanakul Petchu )

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. : ACL25104  
Job No. : VC68AC0064  
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 item 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-0009-24	05-FEB-25
Waveform Generator	335113	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33981A	MY3220104	EEL-007-24	13-FEB-25
Digital Multimeter	23461A	MY32200976	EEL-007-24	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-007-24	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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).

T. Petchu

Cert. No. : ACL25104  
Job No. : VC68AC0064  
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

T. Petchu

Cert. No. : ACL25104  
Job No. : VC68AC0064  
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)
17.2

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

Frequency Weighting	Weighting (dB)
A-weight	14.6
C-weight	20.5
Flat	26.1

## 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	-0.1	-0.1	-0.1	± 1.5
1000	-0.2	-0.2	-0.2	± 1.0
8000	0.2	0.2	0.2	± 5.0

T. Petchu

Cert. No. : ACL25104  
Job No. : VC68AC0064  
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
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

T. Petchu

Cert. No. : ACL25104  
Job No. : VC8AC0864  
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	24.8	-0.2	±1.1

T. Petchu

Cert. No. : ACL25104  
Job No. : VC8AC0864  
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	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	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

T. Petchu

Cert. No. : ACL25104  
Job No. : VC8AC0864  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	89.5	0.1
Negative one-half cycle	89.6	0.1

## 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

T. Petchu

480-481 Sirindhorn Road, Bangna-Phra-Uthit Road, Bangkok, 10700 Thailand  
Tel: +66 2433 0330 Email: calibration@sithiporn.comCert. No. : ACL25879  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A/ Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00621394 / 198641 / 26422  
ID No. : RYG.F80619

Condition As Found : GOOD

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

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

Received Date : 07 JANUARY 2023  
Calibration Date : 21 - 23 JANUARY 2023  
Date of Issue : 24 JANUARY 2023

Calibrated by : Nuthakorn Pinutpaian

Approved by : T. Petchu  
( Thanakul Petchu )

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. : ACL25879  
Job No. : VC8AC0859  
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	EP-0009-24	05-FEB-25
Waveform Generator	33511B	MY53202742	EP-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-107D	62100114	EP-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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).

T. Petchu

Cert. No. : ACL25879  
Job No. : VC8AC0859  
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)
14.6

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	9.1
Flat	24.5

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	±1.5
1000	0.1	0.1	0.1	±1.0
8000	0.1	0.1	0.1	±5.0

T. Petchu

Cert. No. : ACL25879  
Job No. : VC8AC0859  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	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

T. Petchu

Cert. No. : ACL25879  
Job No. : VC8AC0859  
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	34.1	0.1	±1.1
30.0	30.1	0.1	±1.1
29.0	29.1	0.1	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

T. Petchu



Cert. No. : ACL25079  
Job No. : VC68AC0059  
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, T <sub>b</sub> (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	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	126.0	126.0	0.0	±1.0

T. Petchum

Cert. No. : ACL25079  
Job No. : VC68AC0059  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

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

## 11. Overload indication

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

## 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

T. Petchum

## Certificate of Calibration

Customer : ALS Laboratory Group Thailand Co., Ltd.  
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Sam Luang, Bangkok 10250  
Certificate No. : 25-ACT-010  
Request No. : Req-2025-0091

## Unit Under Calibration Details

Measurement item : Acoustic Calibrator  
Manufacturer : RION  
Model : NC-74  
Serial Number : 34178213  
ID : RYG-F30213  
Class : 1  
Range : 94 dB / 1000 Hz  
Instrument Status : Used

## Calibration Environment and Details

Temperature : (23 ± 2 °C)  
Humidity : (50 ± 20 %RH)  
Barometric Pressure : (1013 ± 10 hPa)  
Received Date : 15 January 2025  
Calibration Date : 16 January 2025  
Location of Calibration : LAB 1 Acoustic  
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	12 June 2025
TID Multimeter	2015	1647765	NIMT	16 January 2025

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. Noppidon Luangrat  
Service Calibration Engineer  
Approved By : Mr. Pait Muthavorn  
Calibration Engineer Supervisor  
Issue Date : 16 January 2025

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

INA-2025-ACT-02 Rev 03 Issue Date 5/6/24

Certificate No. : 25-ACT-010  
Request No. : Req-2025-0091

Calibration Results : Without Adjustment						
Calibration Range (dB)	Without Adjustment (dB)	Deviated value	Measured	Deviated value	Uncertainty (± dB)	Acceptance Limits Class 1 (± dB)
94 dB / 1000 Hz	94.11	0.11	-	-	0.13	0.25

Frequency of Sound pressure level						
Calibration Range (Hz)	Without Adjustment (Hz)	Deviated	Measured (Hz)	Deviated	Uncertainty (± %)	Acceptance Limits Class 1 (± %)
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)						
Calibration Range (Hz)	Without Adjustment (Measured %)	Deviated	Measured (%)	Deviated	Uncertainty (± %)	Acceptance Limits Class 1 (± %)
94 dB / 1000 Hz	1.21	-	-	-	0.40	2.5

## Note :

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

Acceptance limit was IEC60820:2017 Class 1  
- The calibration results include the calibration pressure correction  
- The calibration results include the microphone volume correction

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

INA-2025-ACT-02 Rev 03 Issue Date 5/6/24

Certificate No. : 25-ACT-010  
Request No. : Req-2025-0091

## Decision Rule for Statements of Conformity

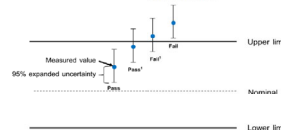
The standard decision rule employed for the statements of conformity to each calibration result will be applied using IEC 60820:2017. Guidelines for the Reporting of Compliance with Specifications in following Fig. and statement.

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

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

Fail = The measurement result was outside 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

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

INA-2025-ACT-02 Rev 03 Issue Date 5/6/24

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY405-407 (Bhumipon Road, Banghathayon, Bangkok, 10250 Thailand)  
Tel : 0800-4663-8008 Email : calibration@sithiporn.comCert. No. : ACL25071  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-S2 / Preamplifier NH-24  
Serial No. : 01122559 / 171212 / 74022  
ID No. : RYG-F30018

Condition As Found : GOOD

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

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by : Nathakorn Pitsupalan

Approved by : T. Petchum  
( Thanakul Petchum )

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. : ACL25071  
Job No. : VC68AC0059  
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 test results of each items were made by observation of each Instruments display and also with SLM's display.

## Condition of this result of calibration :

- Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2877900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-428A	34560495	AA-3001-24	05-FEB-25
- This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
- This certificate is traceable to the international system of unit maintained at :
  - National Institute of Metrology (Thailand).
  - Thailand Institute of Scientific and Technological Research (TISTR).

T. Petchum

Cert. No. : ACL25071  
Job No. : VC68AC0059  
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

T. Petchum

Cert. No. : ACL25071  
Job No. : VC68AC0059  
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	12.0
C-weight	18.3
Flat	24.0

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)	Acceptance Limits
125	Flat	0.3
1000	C-weight	0.1
8000	A-weight	0.1
	Flat	±1.0
		±5.0

T. Petchum

Cert. No. : ACL25971  
Job No. : VC68AC0059  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## 6. Long-term stability

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

T. Petch.

Cert. No. : ACL25971  
Job No. : VC68AC0059  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
117.0	117.0	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	30.0	0.0	±1.1
29.0	28.9	-0.1	±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	25.1	0.1	±1.1

T. Petch.

Cert. No. : ACL25971  
Job No. : VC68AC0059  
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 Weighing	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 ; -2.5
	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	1.5 ; -2.5
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -2.5
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

T. Petch.

Cert. No. : ACL25971  
Job No. : VC68AC0059  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (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

T. Petch.

401-401/5 Witthorn Road, Wangthammongkol, Bangkok, 10700 Thailand  
Tel : +66 2433 8333 Email : calibration@sithiporn.comCert. No. : ACL25972  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-02 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 0112607 / 145554 / 34373  
ID No. : RYG\_PS0019

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10259 THAILAND.

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by : Nuthakorn Pitsuphain

Approved by : T. Petch.  
( Thanakul Petchurai )

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. : ACL25972  
Job No. : VC68AC0059  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (H31) 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-0009-24	05-FEB-25
Waveform Generator	33511B	MY53202742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53202104	EEL_BP 21/02/26	13-FEB-25
Digital Multimeter	33461A	MY53200076	EEL_BP 20/02/26	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/02/26	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42K/A	34560495	AA-3001-24	05-FEB-25

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).

T. Petch.

Cert. No. : ACL25972  
Job No. : VC68AC0059  
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

T. Petch.

Cert. No. : ACL25972  
Job No. : VC68AC0059  
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)
16.0

## 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	17.7
Flat	22.6

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.5	0.5	0.5	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-1.2	-1.2	-1.2	±5.0

T. Petch.

Cert. No. : ACL25972  
Job No. : VC68AC0059  
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	-0.1	0.0	-0.1	±1.5
250	-0.1	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	0.0	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	94.1	0.1	±0.3

T. Petch.



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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	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

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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	29.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.1	0.1	1.5 ; -5.0
	200	800	127.6	127.7	0.1	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

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## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (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	89.5	0.0
Negative one-half cycle	89.5	±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

T. Petch.

401-403 Sirivithayalai Road, Bangkok, Bangkok, 10700 Thailand  
Tel: +66 2433 0330 Email: calibration@sithiporn.comCert. No. : ACL25973  
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. : RYQ\_FS0020

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHUANG PHATTHANAKAN, KHUANG SUAN LUANG,  
DANGKOR, 10256 THAILAND.Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %Received Date : 07 JANUARY 2023  
Calibration Date : 21 - 23 JANUARY 2023  
Date of Issue : 24 JANUARY 2023

Calibrated by : Natsakorn Pinitpattana

Approved by : T. Petch.  
( Thanakul Petchuri )

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.

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-0009-24	05-FEB-25
Waveform Generator	33511B	MY5320204	IF-0007-24	04-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-RP 21/02/07	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-RP 20/02/07	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-RP 22/02/07	15-FEB-25
Programmable Attenuator	MAT-107D	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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).

Cert. No. : ACL25973  
Job No. : VC68AC0659  
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## 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
4. Electrical signal tests of frequency weightings	0.3	0.7
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

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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)
13.4

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

Frequency Weighting (dB)	Weighting (dB)
A-weight	10.8
C-weight	16.7
Flat	22.6

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	-0.2	-0.2	-0.2	±1.5
1000	-0.6	-0.6	-0.6	±1.0
8000	-1.0	-1.0	-1.0	±5.0

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## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.2	0.2	0.3	±2.0
125	0.2	0.2	0.2	±1.5
250	0.1	0.1	0.1	±1.5
500	0.1	0.1	0.1	±1.5
1000	0.0	0.0	0.1	±1.0
2000	0.0	0.0	0.0	±2.0
4000	-0.1	-0.1	0.0	±3.0
8000	-0.1	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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## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	140.0	3.0	±1.1
136.0	140.0	4.0	±1.1
135.0	140.0	5.0	±1.1
134.0	140.0	6.0	±1.1
133.0	133.1	0.1	±1.1
132.0	132.1	0.1	±1.1
131.0	131.1	0.1	±1.1
129.0	129.1	0.1	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±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	30.1	0.1	±1.1
29.0	29.1	0.1	±1.1
28.0	28.2	0.2	±1.1
27.0	27.1	0.1	±1.1
26.0	26.2	0.2	±1.1
25.0	25.3	0.3	±1.1

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Cert. No. : ACL25073  
Job No. : VC08AC0059  
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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	29.2	0.2	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	120.0	120.0	0.0	±1.0

Cert. No. : ACL25073  
Job No. : VC08AC0059  
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## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpk (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		
89.6	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

## Certificate of Calibration

Customer : ALS Laboratory Group Thailand Co., Ltd.  
Name :  
Address : 104 Soi Phatthana 40, Phatthana Road, Suan Luang, Bangkok 10250  
Certificate No. : 25-SLM-114  
Request No. : Req-2025-0603

## Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : RION  
Model : 94-40  
Serial Number : 0122223  
ID : RYG F9002  
Resolution : 0.1 dB  
Instrument Status : Used  
Microphone Class : 2  
Microphone Model : UC-52  
Microphone Serial : 110411  
Pneumofluor Model : N924  
Pneumofluor S/N : 22770  
Instrument Status : Used

## Calibration Environment and Details

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

## Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	Brüel & Kjær	4192	2284983	25 June 2025	NIMT
Audio Generator	Svante	Svante01	131	15 October 2025	WK Electric

## Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.Calibrated By : Mr. Nopphon Lungsant  
Mr. Nopphon Lungsant  
Signature :  
Approved By : Mr. Paib Malharvan  
Mr. Paib Malharvan  
Signature :  
Issue Date : 19 March 2025The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovation Instrument Co., Ltd.  
P30-708-02-01 Rev.01 Issue Date: 5/6/24Certificate No. : 25-SLM-114  
Request No. : Req-2025-0603

## 1. Indication at the calibration check frequency

UUC Setting	Nominal	Level	UUC	ERR	After Adjust	UUC	ERR	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Calibration Setting										
1000 Hz 94 dB	94.06	94.0	-0.06	94.1	-0.04	0.20	0.30	Pass		

Note : Absolute sensitivity was established by the use of Sound Calibrator Brüel Kjaer, Model NC-75, SN:15002736

## 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130	(dB)	(± dB)
UUC Weighting		
A	15.4	0.10

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

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

## 4. Acoustic signal test of frequency weightings (Without Windscreens)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	A C Z	(± dB)	(± dB)	
STD Setting	(dB) (dB) (dB)	(± dB)	(± dB)	
125 Hz	0.3 0.5 0.5	0.60	1.5	Pass
1000 Hz	0.0 0.0 0.0	0.60	1.0	Pass
4000 Hz	0.4 0.4 0.4	0.60	3.0	Pass
8000 Hz	-1.3 -1.3 -1.3	0.70	5.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovation Instrument Co., Ltd.  
P30-708-02-01 Rev.01 Issue Date: 5/6/24Certificate No. : 25-SLM-114  
Request No. : Req-2025-0603

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

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	A C Z	(± dB)	(± dB)	
STD Setting	(dB) (dB) (dB)	(± dB)	(± dB)	
63 Hz	-0.1 0.0 0.0	0.20	2.0	Pass
125 Hz	-0.1 0.0 0.0	0.20	1.5	Pass
250 Hz	0.0 0.0 0.0	0.20	1.5	Pass
500 Hz	0.0 0.1 0.0	0.20	1.5	Pass
1000 Hz	0.0 0.0 0.0	0.20	1.0	Pass
2000 Hz	0.0 0.1 0.0	0.20	2.0	Pass
4000 Hz	0.0 0.0 0.0	0.20	3.0	Pass
8000 Hz	0.1 0.1 0.0	0.20	5.0	Pass
16000 Hz	-1.3 -1.3 0.0	0.20	15.0	Pass

## 6. Frequency and time weightings at 1 kHz

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

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovation Instrument Co., Ltd.  
P30-708-02-01 Rev.01 Issue Date: 5/6/24Certificate No. : 25-SLM-114  
Request No. : Req-2025-0603

## 7. Long Term Stability

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

## 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	REF	UUC	ERR	(± dB)	
STD dB	(dB)	(dB)	(dB)	(± dB)	
130.00	138	137.9	-0.1	1.1	Pass
134.00	134	134.0	0.0	1.1	Pass
120.00	129	129.0	0.0	1.1	Pass
124.00	124	124.0	0.0	1.1	Pass
110.00	119	119.0	0.0	1.1	Pass
114.00	114	114.0	0.0	1.1	Pass
100.00	109	109.0	0.0	1.1	Pass
96.00	104	104.0	0.0	1.1	Pass
90.00	99	99.0	0.0	1.1	Pass
94.00	94	94.0	0.0	1.1	Pass
80.00	89	89.0	0.0	1.1	Pass
84.00	84	84.0	0.0	1.1	Pass
70.00	79	79.0	0.0	1.1	Pass
74.00	74	74.0	0.0	1.1	Pass
60.00	60	60.0	0.0	1.1	Pass
64.00	64	64.0	0.0	1.1	Pass
50.00	50	50.0	0.0	1.1	Pass
54.00	54	54.0	0.0	1.1	Pass
40.00	40	40.0	0.0	1.1	Pass
44.00	44	44.0	0.0	1.1	Pass
30.00	30	30.0	0.0	1.1	Pass
34.00	34	34.0	0.0	1.1	Pass
20.00	20	20.1	0.1	1.1	Pass
24.00	24	24.0	0.0	1.1	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovation Instrument Co., Ltd.  
P30-708-02-01 Rev.01 Issue Date: 5/6/24Certificate No. : 25-SLM-114  
Request No. : Req-2025-0603

## 9. Level linearity including the level range control

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

## 10. Tone burst response

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

## 11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / C / 35-141	REF	UUC	ERR	(± dB)	
STD Setting	(dB)	(dB)	(dB)	(± dB)	
Complete cycle	136.4	135.8	-0.60	3.0	Pass
Positive half cycle	135.4	135.2	-0.20	2.0	Pass
Negative half cycle	135.4	135.2	-0.20	2.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovation Instrument Co., Ltd.  
P30-708-02-01 Rev.01 Issue Date: 5/6/24Certificate No. : 25-SLM-114  
Request No. : Req-2025-0603

## 12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UUC	(± dB)	(± dB)	
STD Setting	(dB)	(± dB)	(± dB)	
Positive one-half cycle	130.5			
Negative one-half cycle	130.4			
Deviated	0.1	0.20	1.5	Pass

## 13. High Level Stability

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

## Note :

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

Acceptance limit and Maximum-permitted Uncertainty were IEC 61672-3:2013

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovation Instrument Co., Ltd.  
P30-708-02-01 Rev.01 Issue Date: 5/6/24

Cert. No. : ACL25101  
Page : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 01173610 / 143485 / 22619  
ID No. : RYG\_FS0389

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10256 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 1 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 14 JANUARY 2023  
Calibration Date : 27-29 JANUARY 2023  
Date of Issue : 30 JANUARY 2023

REVIEW BY : *S.P.S.*  
APPROVED BY : *T.P.*  
NEXT CAL DATE : 26/01/2026

Calibrated by : Nuthakorn Pitsupatim

Approved by : *T.P.*  
( Thanakul Petchurani )

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. : ACL25101  
Job No. : VC68AC0064  
Page : 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 Acoustic chamber and Reference Standard Instruments.  
For test results of each item 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	IF-0009-24	05-FEB-25
Waveform Generator	33511B	MY32032742	IF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY3320104	EEL-BP 21/02/27	13-FEB-25
Digital Multimeter	33461A	MY3320076	EEL-BP 20/02/27	13-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/02/27	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	IF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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 :

- 1.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL25101  
Job No. : VC68AC0064  
Page : 3 of 8

### Summary of Measurement Results :

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 20 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. : ACL25101  
Job No. : VC68AC0064  
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 (dB)
A-weight 16.3
C-weight 22.1
Flat 28.0

#### 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)
	Flat C-weight A-weight Acceptance Limits
125	0.4 0.4 0.4 ±1.5
1000	0.1 0.1 0.1 ±1.0
8000	-0.2 -0.2 -0.2 ±0.0

Cert. No. : ACL25101  
Job No. : VC68AC0064  
Page : 5 of 8

#### 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.1	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	0.1	±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. : ACL25101  
Job No. : VC68AC0064  
Page : 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	0.1	±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	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	26.9	-0.1	±1.1
26.0	26.0	0.0	±1.1
25.0	24.9	-0.1	±1.1

Cert. No. : ACL25101  
Job No. : VC68AC0064  
Page : 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	108.0	0.0	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

Cert. No. : ACL25101  
Job No. : VC68AC0064  
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#### 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepack (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	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	89.6	±1.5
Negative one-half cycle	89.6	±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	137.1	137.0	0.1	±0.3

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

End of Calibration Certificate

Cert. No. : ACL25101  
Page : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A/ Microphone UC-52 / Preamplifier NH-24  
Serial No. : 09023392 / 198639 / 26420  
ID No. : RYG\_FS0617

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10256 THAILAND.

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

Received Date : 07 JANUARY 2023  
Calibration Date : 21-23 JANUARY 2023  
Date of Issue : 24 JANUARY 2023

Calibrated by : Nuthakorn Pitsupatim

Approved by : *T.P.*  
( Thanakul Petchurani )

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. : ACL25077  
Job No. : VC68AC0059  
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-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1079	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration 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).

*T. Petch*Cert. No. : ACL25077  
Job No. : VC68AC0059  
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

*T. Petch*Cert. No. : ACL25077  
Job No. : VC68AC0059  
Page : 4 of 8

## Result of calibration.

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Weighting (dB)
A-weight	12.6
C-weight	18.7
Flat	26.4

## 3. Acoustical signal tests of frequency weightings

## Meter free-field acoustic response at a level of 94 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	1.2	1.2	1.2	±5.0

*T. Petch*Cert. No. : ACL25077  
Job No. : VC68AC0059  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-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	-0.1	±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	93.9	-0.1	±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

*T. Petch*Cert. No. : ACL25077  
Job No. : VC68AC0059  
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	135.1	0.1	±1.1
134.0	134.1	0.1	±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	129.1	0.1	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	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	25.0	0.0	±1.1

*T. Petch*Cert. No. : ACL25077  
Job No. : VC68AC0059  
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	116.9	-0.1	1.0 ; -2.5
Slow	200	800	134.0	134.0	0.0	±1.0
	2	8	108.0	108.0	0.0	1.5 ; -5.0
SEL	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

*T. Petch*Cert. No. : ACL25077  
Job No. : VC68AC0059  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (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	131.0	131.0	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
Positive one-half cycle	89.5	±1.5
Negative one-half cycle	89.5	±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	131.0	131.0	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

*T. Petch*403-403/3 Sathorn Road, Bangkok, Thailand, 10120 Thailand  
Tel : +66 2433 8038 Email : calibration@sithiporn.com

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A/Microphone UC-52 / Pre-amplifier NH-24  
Serial No.: 00623393 / 198640 / 26421  
ID No.: RYG\_FS0618

## Condition As Found :

GOOD

## Customer :

ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, 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 : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by : Nathakorn Pitsupaporn

Approved by :

*T. Petch*  
( Thakmai Petchurai )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.*T. Petch*Cert. No. : ACL25078  
Job No. : VC68AC0059  
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-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1079	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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).

*T. Petch*

Cert. No. : ACL25978  
Job No. : VC68AC0059  
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

S. Petchur

Cert. No. : ACL25978  
Job No. : VC68AC0059  
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)
16.6

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

Frequency Weighting	Weighting (dB)
A-weight	13.1
C-weight	17.9
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	0.5	0.5	±1.5
1000	0.1	0.1	0.1	±1.0
8000	2.3	2.2	2.3	±5.0

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Cert. No. : ACL25978  
Job No. : VC68AC0059  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting networks 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	-0.1	±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

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Job No. : VC68AC0059  
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	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. : VC68AC0059  
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	79.0	78.9	-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	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

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Cert. No. : ACL25978  
Job No. : VC68AC0059  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leq (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

S. Petchur

483/483/2 Sirinthorn Road, Bangna Suburb, Bangkok, 10700 Thailand  
Tel: +66 2 653 0230 Email: calibration@sithiporn.comCert. No. : ACL25111  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00623395 / 198642 / 26423  
ID No. : RYG\_FS0620

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHUANG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10256 THAILAND.Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

Calibrated by : Nuthakorn Pitsupaisan

Approved by : S. Petchur  
( Thanakul Petchurani )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. : ACL25111  
Job No. : VC68AC0064  
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 test 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-0009-24	05-FEB-25
Waveform Generator	335113	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220194	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220975	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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).

S. Petchur

Cert. No. : ACL25111  
Job No. : VC68AC0064  
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

S. Petchur

Cert. No. : ACL25111  
Job No. : VC68AC0064  
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	9.9
C-weight	22.3
Flat	

## 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	0.5	0.5	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	0.4	0.4	0.4	±5.0

Cert. No. : ACL25111  
Job No. : VC68AC0064  
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	0.0	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. : ACL25111  
Job No. : VC68AC0064  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
94.0	94.0	0.0	±1.1
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	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	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	25.1	0.1	±1.1

Cert. No. : ACL25111  
Job No. : VC68AC0064  
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	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

Cert. No. : ACL25111  
Job No. : VC68AC0064  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (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	135.0	135.0	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

401-403 Sitaram Road, Bangkok, Thailand, 10100 Thailand  
Tel : +66 2425 8201 Email : calibrating@sithiporn.comCert. No. : ACL25112  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NI-42A / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00623396 / 198643 / 26424  
ID No.: RYG-F50621

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHUANG PHATTANAKAN, 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 : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

Calibrated by : Nuthakorn Pitsupitum

Approved by :

T. Petch.  
( Thanakul Petchum )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. : ACL25112  
Job No. : VC68AC0064  
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 Anchoic 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-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	2540A.1	MY5320104	EEL-BP 21/02/07	15-FEB-25
Digital Multimeter	34461A	MY53220076	EEL-BP 30/02/07	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/02/07	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAJ	34560495	AA-3001-24	05-FEB-25

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 :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).

Cert. No. : ACL25112  
Job No. : VC68AC0064  
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. : ACL25112  
Job No. : VC68AC0064  
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	12.3
C-weight	18.9
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	0.3	0.3	0.3	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	0.6	0.6	0.6	± 5.0



Cert. No. : ACL25112  
Job No. : VC68AC0664  
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	0.1	0.1	0.1	±1.5
250	0.1	0.1	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

Z. Reth.

Cert. No. : ACL25112  
Job No. : VC68AC0664  
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	30.1	0.1	±1.1
29.0	29.0	0.0	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.2	0.2	±1.1
25.0	25.1	0.1	±1.1

Z. Reth.

Cert. No. : ACL25112  
Job No. : VC68AC0664  
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	29.1	0.1	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	1.5; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5; -5.0
SEL	2	8	108.0	108.0	0.0	1.0; -2.5
	200	800	128.0	128.1	0.1	±1.0

Z. Reth.

Cert. No. : ACL25112  
Job No. : VC68AC0664  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	136.0	136.0	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	89.6	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


Z. Reth.

## CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research

DATE OF ISSUE 13 February 2025

CERTIFICATE NUMBER 232797

 Cirrus Research  
Acoustic House  
Bridlington Road  
Hummerby  
North Yorkshire  
YO14 0PH  
United KingdomPage 1 of 2  
Approved signatory  
R. Thomas  
Electronically signed:  


## doseBadge Reader : IEC 60942:2003

## Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: RC-110A

Serial number: 73729

Class: 2

## Test summary

Date of calibration: 12 February 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 W52F condenser microphone type MK224 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: 11/02/2028This 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  
232797

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## Environmental conditions

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

Before Pressure: 101.42 kPa Temperature: 25.1 °C Humidity: 33.1 %

After Pressure: 101.42 kPa Temperature: 25.2 °C Humidity: 35.0 %

## Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	1063074
Environmental Monitor	Comet	T7510	21962628

## Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	112.51	112.45	112.61	112.52	-1.48	±0.75	0.11 dB
Distortion (%)	< 4.00	1.46	1.70	2.01	1.72	1.72	+4.00	0.13 %
Frequency (Hz)	1000.0	998.2	998.2	998.2	998.2	-1.8	±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	113.99	114.01	114.00	0.00	±0.75	0.11 dB
Distortion (%)	< 4.00	0.97	0.98	0.95	0.96	0.96	+4.00	0.13 %
Frequency (Hz)	1000.0	998.1	998.1	998.1	998.1	-1.9	±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

## CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 29 April 2025 CERTIFICATE NUMBER 239326

 Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hummerby  
North Yorkshire  
YO14 0PH  
United KingdomPage 1 of 8  
Approved signatory  
N. Smith  
Electronically signed:  


## Dosimeter : IEC 61252-1993+A1:2000

## Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: CR110AS

Serial number: YF573

Firmware version: 5.4

## Test summary

Date of calibration: 29 April 2025

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

## Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDEXR4732
Attenuator	Cirrus Research	ZE-952	64370
Environmental Monitor	Comet	T7510	16965334
doselBadge Reader	Cirrus Research plc	RC-110A	100499

## Notes

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  
239326

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## Environmental conditions

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

Before Pressure: 101.98 kPa Temperature: 20.9 °C Humidity: 50.7 %

After Pressure: 101.98 kPa Temperature: 21.0 °C Humidity: 52.0 %

## Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

## CERTIFICATE OF CALIBRATION

Certificate Number  
239326

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## Laboratory uncertainties

Requirement	Value
Absolute acoustic sensitivity	0.2 dB
Level linearity	0.15 dB
Short duration signals	0.2 dB
Overload latching indication	0.2 dB
Electrical freq. weighting 125 Hz	0.15 dB
Electrical freq. weighting 8 kHz	0.15 dB

CERTIFICATE OF CALIBRATION

Certificate Number: 239326  
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Result: Passed

B1: Absolute Acoustical Sensitivity

Frequency: 1000 Hz      Uncertainty: 0.2 dB

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	111.20	2.8	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Response To Steady Signals

Frequency: 1000 Hz      Uncertainty: 0.2 dB      Range: 80 ~ 130 dB

Input Level (dB)	Expected Exposure (Pa <sup>2</sup> /h)	Exposure (Pa <sup>2</sup> /h)	Duration (s)	Deviation (Pa <sup>2</sup> /h)	Limits (Pa <sup>2</sup> /h)	Deviation (%)	Limits (%)
80	0.000222	0.000223	20	-0.000051	0.000175 / 0.000280	23	-21 / +26
90	0.002222	0.002074	20	0.000148	0.001755 / 0.002800	-7	-21 / +26
100	0.022222	0.021222	20	0.001000	0.017555 / 0.028000	-5	-21 / +26
110	0.222222	0.212221	20	0.010001	0.175555 / 0.280000	-5	-21 / +26
120	2.222222	3.007153	20	0.215069	2.545555 / 4.000000	-7	-21 / +26
130	22.222223	21.716383	20	0.505840	17.555556 / 28.000001	-2	-21 / +26

CERTIFICATE OF CALIBRATION

Certificate Number: 239326  
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Result: Passed

B3: Frequency Weightings

Reference Frequency: 1000 Hz      Reference Exposure: 5.1970572512588  
Reference Input Level: 127 dB      Duration: 10 Seconds

Frequency (Hz)	Exposure (Pa <sup>2</sup> /h)	Exposure Ratio	Ratio Limit	Uncertainty
120	0.119059	0.02629	0.01 / 0.02494	0.10
8000	2.166494	0.4169	0.246 / 2.455	0.15

B4: Short-Duration Signals

Uncertainty: 0.2 dB      Frequency: 4000 Hz

Input Level (dB)	Burst Level (dB)	Ratio	Duration (s)	Burst Duration (ms)	Duration Between Bursts (ms)	Expected Exposure (Pa <sup>2</sup> /h)	Exposure (Pa <sup>2</sup> /h)	Deviation (%)	Limits (%)
114	95	1:100	10	10	990	0.003358	0.003434	2	-21 / +26
129	100	1:1000	10	1	999	0.010611	0.009917	-9	-29 / +41

CERTIFICATE OF CALIBRATION

Certificate Number: 239326  
Page 6 of 6

Result: Passed

B6: Latching Overload Indicator

Frequency: 1000 Hz      Uncertainty: 0.2 dB

Level (dB)	Expected To Overload	Overloaded
130	No	No
133	Yes	Yes

End of results

INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7/109 MOO 10, SOI SUTTHAKARN 11 TAMBON BANG KAE, AMPHUR BANG PHU SAMUT PRAKAN PROVINCE 10640 THAILAND

Tel: 0899-2199889 / Fax: 0899-2191740

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INSTRUMENT

Page 1 of 2

Certificate of Calibration

Certificate No.: 25-ACT-077

Request No.: Req-2025-1059

Customer

Name: ALS Laboratory Group Thailand Co., Ltd.

Address: 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10259

Unit Under Calibration Details

Measurement item: Acoustic Calibrator

Manufacturer: Cirus

Model: CR-516

Serial Number: 100049

ID: RYG JS0635

Calibration Environment and Details

Temperature: (23 ± 2) °C

Humidity: (50 ± 20) %RH

Barometric Pressure: (1013 ± 0.01 kPa)

Received Date: 14 May 2025

Calibration Date: 26 May 2025

Location of Calibration: LAB 1 Acoustic

Calibration Procedure: In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard

Model: SV 35A

Serial Number: 58079

Traceable: EEI

Due Calibration: 12 June 2025

Tracability

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 Luangrat

Approved By: Mr. Paitit Mahavorn

Service Calibration Engineer

Calibration Engineer Supervisor

Issue Date: 26 May 2025

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

PM 708 ACT-02 Rev.04 Issue date: 17/07/2025

INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7/109 MOO 10, SOI SUTTHAKARN 11 TAMBON BANG KAE, AMPHUR BANG PHU SAMUT PRAKAN PROVINCE 10640 THAILAND

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Page 2 of 2

Certificate No.: 25-ACT-077

Request No.: Req-2025-1059

Sound pressure level

Calibration Range: Without Adjustment (dB)      Adjustment (dB)      Uncertainty (± dB)

Calibration Range (dB)	Measured	Deviated value	Measured	Deviated value	Uncertainty (± dB)
94 dB / 1000 Hz	93.86	-0.14	-	-	0.11
114 dB / 1000 Hz	113.83	-0.17	-	-	0.11

Frequency of Sound pressure level

Calibration Range: Without Adjustment      Adjustment      Uncertainty (± %)

Calibration Range (Hz)	Measured (Hz)	Deviated value	Measured (Hz)	Deviated value	Uncertainty (± %)
94 dB / 1000 Hz	1000.0	0.00	-	-	0.01
114 dB / 1000 Hz	1000.0	0.00	-	-	0.010

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

Calibration Range: Without Adjustment      Adjustment      Uncertainty (± %)

Calibration Range (Hz)	Measured (%)	Deviated value	Measured (%)	Deviated value	Uncertainty (± %)
94 dB / 1000 Hz	2.31	-	-	-	0.01
114 dB / 1000 Hz	0.91	-	-	-	0.17

Note:

The calibration results include the calibration pressure correction.

The calibration results include the microphone volume correction.

End of Calibration

JIRANATTE ASSOCIATES CO., LTD.

Accredited calibration laboratory

ISO/IEC 17025:2017

ACC-756 TO 2505

CALIBRATION UNIT

Acoustic calibration laboratory

Calibration services department

CALIBRATION REPORT

Calibration report number: C204-004-03

MEASUREMENT ITEM

MANUFACTURER: Cirus Research plc

MODEL TYPE: CR-120A

SERIAL NUMBER: IMC03015

ID NUMBER: RRG JS0636

CONDITION AS RECEIVED: Used item

CUSTOMER: JAL Laboratory group (Thailand) Co., Ltd.

RECEIVED DATE: 18 Sep 2025

MEASUREMENT DATE: 19 Sep 2025

ISSUE DATE: 19 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: 1009.0 hPa

PRECONDITIONING

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

STANDARD USED DURING CALIBRATION:

Instrument name: Sound Calibrator      Manufacturer: Cirus Research plc      Model: CR-516      Serial number: 09028

Remarks: Sound Calibrator 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.

Sound Calibrator Level (dB)	Microphone reading (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by: Mr. Noppadon Luangrat

Approved by: Mr. Paitit Mahavorn

Service Calibration Engineer

Calibration Department Manager

Issue Date: 19 Sep 2025

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

PM 708 ACT-02 Rev.04 Issue date: 17/07/2025

JIRANATTE ASSOCIATES CO., LTD.

Accredited calibration laboratory

ISO/IEC 17025:2017

ACC-756 TO 2505

CALIBRATION UNIT

Acoustic calibration laboratory

Calibration services department

CALIBRATION REPORT

Calibration report number: C204-004-03

MEASUREMENT ITEM

MANUFACTURER: Cirus Research plc

MODEL TYPE: CR-120A

SERIAL NUMBER: IMC03015

ID NUMBER: RRG JS0637

CONDITION AS RECEIVED: Used item

CUSTOMER: JAL Laboratory group (Thailand) Co., Ltd.

RECEIVED DATE: 18 Sep 2025

MEASUREMENT DATE: 19 Sep 2025

ISSUE DATE: 19 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: 1009.0 hPa

PRECONDITIONING

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

STANDARD USED DURING CALIBRATION:

Instrument name: dosimeter Reader      Manufacturer: Cirus Research plc      Model: CR-115A      Serial number: 81051

Remarks: dosimeter 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.

Dosimeter Reader Level (dB)	Microphone reading (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by: Mr. Noppadon Luangrat

Approved by: Mr. Paitit Mahavorn

Service Calibration Engineer

Calibration Department Manager

Issue Date: 19 Sep 2025

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

PM 708 ACT-02 Rev.04 Issue date: 17/07/2025

JIRANATTE ASSOCIATES CO., LTD.

Accredited calibration laboratory

ISO/IEC 17025:2017

ACC-756 TO 2505

CALIBRATION UNIT

Acoustic calibration laboratory

Calibration services department

CALIBRATION REPORT

Calibration report number: C204-004-03

MEASUREMENT ITEM

MANUFACTURER: Cirus Research plc

MODEL TYPE: CR-120A

SERIAL NUMBER: IMC03015

ID NUMBER: RRG JS0636

CONDITION AS RECEIVED: Used item

CUSTOMER: JAL Laboratory group (Thailand) Co., Ltd.

RECEIVED DATE: 18 Sep 2025

MEASUREMENT DATE: 19 Sep 2025

ISSUE DATE: 19 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: 1009.0 hPa

PRECONDITIONING

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

STANDARD USED DURING CALIBRATION:

Instrument name: dosimeter Reader      Manufacturer: Cirus Research plc      Model: CR-115A      Serial number: 81051

Remarks: dosimeter 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.

Dosimeter Reader Level (dB)	Microphone reading (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by: Mr. Noppadon Luangrat

Approved by: Mr. Paitit Mahavorn

Service Calibration Engineer

Calibration Department Manager

Issue Date: 19 Sep 2025

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

PM 708 ACT-02 Rev.04 Issue date: 17/07/2025

JIRANATTE ASSOCIATES CO., LTD.

Accredited calibration laboratory

ISO/IEC 17025:2017

ACC-756 TO 2505

CALIBRATION UNIT

Acoustic calibration laboratory

Calibration services department

CALIBRATION REPORT

Calibration report number: C204-004-03

MEASUREMENT ITEM

MANUFACTURER: Cirus Research plc

MODEL TYPE: CR-120A

SERIAL NUMBER: IMC03015

ID NUMBER: RRG JS0637

CONDITION AS RECEIVED: Used item

CUSTOMER: JAL Laboratory group (Thailand) Co., Ltd.

RECEIVED DATE: 18 Sep 2025

MEASUREMENT DATE: 19 Sep 2025

ISSUE DATE: 19 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: 1009.0 hPa

PRECONDITIONING

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

STANDARD USED DURING CALIBRATION:

Instrument name: dosimeter Reader      Manufacturer: Cirus Research plc      Model: CR-115A      Serial number: 81051

Remarks: dosimeter 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.

Dosimeter Reader Level (dB)	Microphone reading (dB)	Error (dB)	Status
114.0	114.0	0.0	✓

Calibrated by: Mr. Noppadon Luangrat

Approved by: Mr. Paitit Mahavorn

Service Calibration Engineer

Calibration Department Manager

Issue Date: 19 Sep 2025

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

PM 708 ACT-02 Rev.04 Issue date: 17/07/2025



CERTIFICATE OF CALIBRATION

ISSUED BY

Cirrus Research plc

DATE OF ISSUE

17 September 2025

CERTIFICATE NUMBER

249518

Cirrus Research plc

Acoustic House

Bridlington Road

Hummerby

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

Model: RC-110A

Serial number: 76062

Class: 2

Notes:

The doseBadge reader described 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 dose were made.

The sound pressure level was measured using a W52F condenser microphone type MK224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.3 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.

Test summary

Date of calibration: 17 September 2025

The doseBadge reader described 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 dose were made.

The sound pressure level was measured using a W52F condenser microphone type MK224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.3 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.

Review by:

Approved by:

Next Cal Date: 16/09/2026

This certificate provides traceability of measurement to the SI system of units and to units of measurement realised at the National 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:

249518

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test

Before Pressure: 100.31 kPa Temperature: 21.6 °C Humidity: 48.1 %

After Pressure: 100.30 kPa Temperature: 21.7 °C Humidity: 48.1 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	1053426
Environmental Monitor	Comet	77510	21962028

Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.49	113.48	113.40	113.48	-0.51	±0.75	0.11 dB
Distortion (%)	< 4.00	0.29	0.32	0.31	0.31	0.31	+4.00	0.13 %
Frequency (Hz)	1000.0	1009.5	1009.5	1009.5	1009.5	9.5	±20.0	0.1 Hz

The measured quantities or deviations (as applicable), obtained 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	114.00	114.00	114.00	0.00	±0.75	0.11 dB
Distortion (%)	< 4.00	0.33	0.31	0.31	0.32	0.32	+4.00	0.13 %
Frequency (Hz)	1000.0	1009.5	1009.5	1009.5	1009.5	9.5	±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

J NAC

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Accredited calibration laboratory

Collection services department

REVIEW BY

APPROVED BY

NEXT CAL DATE

16/09/2026

Certificate Number

249518

Page 1 of 2

MEASUREMENT ITEM

Instrument name: doseBadge Reader

Model/Type: RC-110A

Serial Number: 76062

ID Number: 76062

CONDITION AS-RECEIVED

CUSTOMER

Customer name: J. Smith

Customer address: 104 Phrasaraksa Rd., Phrasaraksa Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

13 Sep 2024

MEASUREMENT DATE

16 Sep 2024

ISSUE DATE

17 Sep 2024

ENVIRONMENTAL CONDITIONS

Ambient conditions in the laboratory are as follows:

Temperature: 23.0 ± 3.0 °C

Relative Humidity: 55.0 ± 15.0 %RH

Atmospheric Pressure: 1013.0 ± 10 hPa

PRECONDITIONING

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

STANDARD USED DURING CALIBRATION:

Instrument name: doseBadge Reader

Manufacturer: Cirrus Research plc

Model: RC-110A

Serial number: 76062

Benchmark: 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 (dB)	Reference	Error (dB)	Status
114.0	114.0	0.0	Pass

Calibrated by:

☒ Mr. S. Smith

☒ Miss J. Smith

☒ Miss J. Smith

Approved signature:

Mr. P. Smith

Calibration Department Manager

Remarks:

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

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NEXT CAL DATE

16/09/2026

Certificate No. : COT-066-68

Page 1 of 2 Pages

MEASUREMENT ITEM

Instrument name: DoseBadge Reader

Model/Type: RC-110A

Serial Number: 76062

ID Number: 76062

CONDITION AS-RECEIVED

CUSTOMER

Customer name: J. Smith

Customer address: 104 Phrasaraksa Rd., Phrasaraksa Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

13 Mar 2025

MEASUREMENT DATE

17 Mar 2025

ISSUE DATE

20 Mar 2025

ENVIRONMENTAL CONDITIONS:

Ambient conditions in the laboratory are as follows:

Temperature: 23.0 ± 3.0 °C

Relative Humidity: 55.0 ± 15.0 %RH

NOTES:

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

TABULATION OF RESULTS:

The table on next page gives the measured values.

Calibrated by:

☒ Mr. S. Smith

☒ Miss J. Smith

☒ Miss J. Smith

Approved signature:

Mr. P. Smith

Calibration Department Manager

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NEXT CAL DATE

16/09/2026

Certificate No. : COT-067-68

Page 2 of 2 Pages

Continuation of Certificate of Calibration Number COT-066-68

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3301.2, S/N: 21003217.

Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.067	20.1	0.0	0.009
80	25.052	25.1	0.0	0.009
80	30.046	30.1	0.0	0.009
80	35.045	35.1	0.1	0.009
80	40.039	40.1	0.1	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP3271.2, S/N: 21003242.

Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.067	20.0	-0.1	0.009
110	25.052	25.0	-0.1	0.009
110	30.046	30.0	0.0	0.009
110	35.045	35.0	0.0	0.009
110	40.039	40.0	0.0	0.009

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 21003783.

Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.067	20.2	0.1	0.009
75	25.052	25.1	0.0	0.009
75	30.046	30.0	0.0	0.009
75	35.045	35.0	0.0	0.009
75	40.039	39.0	-0.1	0.009

USC\* Line Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

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NEXT CAL DATE

16/09/2026

Certificate No. : COT-068-68

Page 2 of 2 Pages

Continuation of Certificate of Calibration Number COT-067-68

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3301.2, S/N: 21003217.

Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.067	20.1	0.0	0.009
80	25.052	25.1	0.0	0.009
80	30.046	30.1	0.0	0.009
80	35.045	35.1	0.1	0.009
80	40.039	40.1	0.1	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP3271.2, S/N: 21003242.

Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.067	20.0	-0.1	0.009
110	25.052	25.0	-0.1	0.009
110	30.046	30.0	0.0	0.009
110	35.045	35.0	0.0	0.009
110	40.039	40.0	0.0	0.009

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 21003783.

Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.067	20.2	0.1	0.009
75	25.052	25.1	0.0	0.009
75	30.046	30.0	0.0	0.009
75	35.045	35.0	0.0	0.009
75	40.039	39.0	-0.1	0.009

USC\* Line Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

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NEXT CAL DATE

16/09/2026

Certificate No. : COT-069-68

Page 2 of 2 Pages

Continuation of Certificate of Calibration Number COT-068-68

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3301.2, S/N: 21003217.

Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.067	20.1	0.0	0.009
80	25.052	25.1	0.0	0.009
80	30.046	30.1	0.1	0.009
80	35.045	35.1	0.1	0.009
80	40.039	40.1	0.1	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP3271.2, S/N: 21003242.

Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.067	20.0	-0.1	0.009
110	25.052	25.0	-0.1	0.009
110	30.046	30.0	0.0	0.009
110	35.045	35.0	0.0	0.009
110	40.039	40.0	0.0	0.009

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 21003783.

Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.067	20.1	0.0	0.009
75	25.052	25.0	-0.1	0.009
75	30.046	30.0	0.0	0.009
75	35.045	35.0	-0.1	0.009
75	40.039	39.0	-0.2	0.009

USC\* Line Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

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NEXT CAL DATE

16/09/2026

Certificate No. : COT-069-68

Page 1 of 2 Pages

MEASUREMENT ITEM

Instrument name: DoseBadge Reader

Model/Type: RC-110A

Serial Number: 76062

ID Number: 76062

CONDITION AS-RECEIVED

CUSTOMER

Customer name: J. Smith

Customer address: 104 Phrasaraksa Rd., Phrasaraksa Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

17 Jan 2025

MEASUREMENT DATE

27 Jan 2025

ISSUE DATE

29 Jan 2025

ENVIRONMENTAL CONDITIONS:

Ambient conditions in the laboratory are as follows:

Temperature: 23.0 ± 3.0 °C

Relative Humidity: 55.0 ± 15.0 %RH

NOTES:

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

TABULATION OF RESULTS:

The table on next page gives the measured values.

Calibrated by:

☒ Mr. S. Smith

☒ Miss J. Smith

☒ Miss J. Smith

Approved signature:

Mr. P. Smith

Calibration Department Manager

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NEXT CAL DATE

16/09/2026

Certificate No. : COT-069-68

Page 2 of 2 Pages

Continuation of Certificate of Calibration Number COT-068-68

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3301.2, S/N: 21003217.

Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.067	20.1	0.0	0.009
80	25.052	25.1	0.0	0.009
80	30.046	30.1	0.0	0.009
80	35.045	35.1	0.1	0.009
80	40.039	40.1	0.1	0.009

Table 2: This equipment was connected with Globe thermometer probe Model: TP3271.2, S/N: 21003242.

Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.067	20.0	-0.1	0.009
110	25.052	25.0	-0.1	0.009
110	30.046	30.0	0.0	0.009
110	35.045	35.0	0.0	0.009
110	40.039	40.0	0.0	0.009

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 21003783.

Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.067	20.2	0.2	0.009
75	25.052	25.1	0.1	0.009
75	30.046	30.1	0.1	0.009
75	35.045	35.1	0.1	0.009
75	40.039	40.0	0.0	0.009

USC\* Line Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*





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Agilent CrossLab Compliance Service

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

230.0

230.3

°C

Accuracy:

±0.3

°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

100.0

°C

Accuracy:

0.0

°C

Agilent Recommended:

±1.0

% setpoint in K

(-3.7

°C

)

±1.0

% setpoint in K

(3.7

°C

)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name:

7600

Setpoint Status:

Pass

Setpoint/Average

Temperature:

100.0

100.0167

°C

Stability:

0.1

°C

Agilent Recommended:

±0.5

°C

Overall GC Oven Temperature Stability Test Status

Pass

Brewing Run

Tested Combination1

Front

SSL

/ Front

FD

Name:

Injection Tower

7603A

Date:

October 23, 2024 9:27:55 AM

System ID:

GC-4\_C011481006

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Agilent CrossLab Compliance Services			
Setpoint Status:		Completed	
Injection Volume on Column:		1.0	µL
Overall Scouting Run Status			
Completed			
Noise and Drift			
Tested Combination1		Front	SSL / Front FID
Name:		7693	
Setpoint Status:		Pass	
Base Signal:		14.05	pA
		ASTM Noise	Drift
		pA	pA/hr
		0.05	0.03
Agilent Recommended:		<= 0.10	<= 2.50
Status:		Pass	Pass
Overall Noise and Drift Test Status			
Pass			
Injection Precision			
Tested Combination1		Front	SSL / Front FID
Name:		7693A	
Setpoint Status:		Pass	
Injection Volume on Column:		1.0	µL
Area RSD:		0.30	%
Agilent Recommended:		<= 3.00	<= 1.00
Overall Injection Precision Test Status			
Pass			
Signal to Noise			

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Agilent CrossLab Compliance Services

Tested Combination1

Front

SSL

/ Front

FID

Injection Tower

7890

Name:

Setpoint Status:

Pass

Signal to Noise:

11078625

Agilent Recommended:

>= 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2

Back

SSL

/ Back

FID

Injection Tower

7683A

Name:

Setpoint Status:

Completed

Injection Volume on Column:

1.0

μL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2

Back

SSL

/ Back

FID

Injection Tower

7890

Name:

Setpoint Status:

Pass

Base Signal:

13.79

μA

ASTM Noise

0.05

Drift

0.01

Agilent Recommended:

<= 0.10

Drift

<= 2.50

Status:

Pass

Date: October 20, 2024 9:27:58 AM  
 System ID: GC-8\_C011461065

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Agilent CrossLab Compliance Services

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2

Back

SGL

/

Back

FID

Name:

7853A

Setpoint Status:

Pass

Injection Volume on Column:

1.0

μL

Area RSD:

1.06

%

Retention Time RSD:

0.93

%

Agilent Recommendation:

≤

3.00

%

≤

1.00

%

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2

Back

SSL

/

Back

FID

Name:

7890

Setpoint Status:

Pass

Signal to Noise:

1771221

Agilent Recommendation:

≥


300000

Overall Signal to Noise Test Status

Pass

Date: October 28, 2024 9:27:55 AM  
 System ID: GC-E\_C11461555

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<div> <div>  Agilent Technologies </div> <div> Agilent CREST Lab Compliance Service </div> </div>	
<h1>Instrument Details</h1>	
<p><b>Purpose</b></p> <p>This section describes the as found system configuration.</p>	
<p><b>Details</b></p>	
System	
System ID	GC-8_CN11481085
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	C1CN410340103
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

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<b>Sampler 2</b>		
Manufacturer	Agilent Technologies	
Type	Injection Tower	
Name	7893A	
Model Number	G4813A	
Serial Number	CN16280128	
Firmware Revision	A.11.06	
Usage	Sample Injection	
Location	Black	
Syringe Volume (µL)	10	
<b>Sampler 3</b>		
Manufacturer	Agilent Technologies	
Type	Tray	
Name	7893A	
Model Number	G4814A	
Serial Number	CN15380030	
Firmware Revision	A.11.05	
Vial Header	Not installed	
<b>Mainframe 1</b>		
Manufacturer	Agilent Technologies	
Name	7890	
Model Number	G3445A	
Serial Number	CN11481008	
Firmware Revision	A.01-16	
Oven Type	Standard	
<hr/>		
Date:	October 12, 2024 9:27:05 AM	
System ID:	GC-E_0011481008	
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<b>Inset 1</b>		
Manufacturer	Agilent Technologies	
Name	7890	
Type	SSL	
Location	Front	
Carrier Gas	Helium	
Control Type	Electronic Pressure Control (EPC)	
Purged Inlet	Yes	
<b>Inset 2</b>		
Manufacturer	Agilent Technologies	
Name	7890	
Type	SSL	
Location	Back	
Carrier Gas	Helium	
Control Type	Electronic Pressure Control (EPC)	
Purged Inlet	Yes	
<b>Detector 1</b>		
Manufacturer	Agilent Technologies	
Name	7800	
Type	FID	
Adapter	Capillary	
Control Type	Electronic Pressure Control (EPC)	
Location	Front	
Makeup Gas	Nitrogen	
<b>Detector 2</b>		
Manufacturer	Agilent Technologies	
Name	7800	
Type	FID	
Adapter	Capillary	
Control Type	Electronic Pressure Control (EPC)	
Location	Back	
Makeup Gas	Nitrogen	

2023 by Agent Technologies

Agent OneCloud Compliance Solutions

Electronic Signature

Purpose

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Details

Full Name of Signer:

Simenghui Tseng

Logout On User Name:

simenghui.tseng@nor.agent.com

Signature Creation Date:

October 22, 2024

Reason for Signature:

Executed protocol and published this original version of document

Regulatory Disclaimer

This document provides a preview 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 demands upon many factors and use of this protocol alone does not ensure compliance. Agent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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Date:

October 22, 2024 9:57:55 AM

System ID:

QC-6-0011483558

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© 2020 by AgileIT Technologies			Agilent CrossLab Compliance Services		
User Name: kshon@chuck.com Report Generated by: ProSource: LAPTOP-CQJSD8WY ID: ZEN_AA_06_06_061841960_GMMW Transaction log:			System ID: GC_6_C08183056 Print Date: October 22, 2024 9:27 AM		
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information	
October 21, 2024 9:16:00 PM	Auto	Session-Created	Session	None	
October 21, 2024 9:18:07 PM	Start	Configuration	Session	None	
October 21, 2024 9:18:07 PM	Auto	Full-Event	Logging	User is logging on and does not require an attach code	
October 21, 2024 9:22:40 PM	Auto	Full-event	Session	CDF awaits for primary hardware (GC) file path. (P:\Method\GC\Conf\Net\INSTR\2024\22.03.msp) CDF File Name: (Da-01.03.msp, CDF Name: Agilent\Biosources\method\process of Method (Da-01.03))	
October 21, 2024 9:22:44 PM	Auto	Configuration	Session	None	
October 21, 2024 9:22:47 PM	Start	Qualification	Session	OQ	
October 21, 2024 9:23:49 PM	Start	Execution	CDS Logon Verification - GC - 7000 - Qualitative test	Run Cause: 1	
October 21, 2024 9:23:58 PM	Start	Execution	CDS Logon Verification - GC - 7000 - Qualitative test	Run Cause: 1	
October 21, 2024 9:23:49 PM	Start	Execution	System Inspection and Basic Safety and Operations - 7000 - Qualitative Test - No steps are associated	Run Cause: 1	
October 21, 2024 9:23:59 PM	Start	Execution	System Inspection and Basic Safety and Operations - 7000 - Qualitative Test - No steps are associated	Run Cause: 1	





Accredited by

NSC-TIS-17025  
Calibration 0426

## Calibration certificate

Calibration Certificate No. 25BKLD006

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	MSE125P-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SCP-WI-08.
Serial / QM Ident. no.	33109993 / RYG_EN0004	This certificate relate and apply this equipment only.

Customer

ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)

616/10 Moo 5 T Maenam Khu, A.Puak Daeng, Rayong 21140, Thailand.

Order no.

2230

Number of pages

4

Date of calibration

20 Feb 2025

This calibration certificate may not be reproduced other than in full except with the permission of NSC-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 06 Mar 2025 Approval of the Calibration Certificate

Person in charge

Mr. Chonchai Inthana

Kachen Latee

Sartorius (Thailand) Co., Ltd.  
129 Rama 9 Road, Huaykhwang  
10310 BangkokVerical®  
Version 6.5

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Calibration certificate No. 25BKLD006

Calibration Certificate

## Calibration object

## Multi interval instrument

Model	MSE125P-100-DU
Serial Number	33109993
Item Ident. no. / Inventory no.	RVY2_EN0004 / ...
Range	1 2
Maximum capacity (Max. load)	60.0000 g 120.0000 g
Measured range	60.0000 g 120.0000 g
Scale interval	0.0001 g 0.0001 g

## Place of calibration

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

## Calibration procedure

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

## Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD shB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M23081975_E2(Traceable to SI unit through TCG)	23 Aug 2025

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Calibration certificate No. 25BKLD006

Calibration Certificate

## Adjustment Status

The measuring device was internally adjusted before the calibration.

## Environmental and measuring conditions

Date of calibration 20 Feb 2025

Temperature at place of calibration / Temp. diff. 24.2 °C / 0.3 K

T<sub>ambient</sub> T<sub>process</sub>

Measuring conditions

Comments

## Measurement results | Measurement uncertainties

Repeatability	Eccentricity
Test load (nominal): 50 g / 100 g	Test load (nominal): 50 g
1 50.00002 g 50.00002 g	Center 50.00002 g
2 50.00001 g 50.00001 g	Front left 50.00000 g
3 50.00003 g 50.00003 g	Back left 50.00000 g
4 50.00002 g 50.00002 g	Back right 50.00000 g
5 50.00001 g 50.00001 g	Front right 50.00003 g
6 50.00002 g 50.00002 g	Maximum deviation from center loading indication
7 50.00001 g 50.00001 g	Δm<max = 0.00002 g
8 50.00001 g 50.00001 g	
9 50.00002 g 50.00002 g	
10 50.00002 g 50.00002 g	
a = 0.00007 g a = 0.00003 g	

## Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
0.01000 g	0.01000 g	0.00000 g	2.00	0.000004 g	0.24 %
0.10000 g	0.10000 g	0.00000 g	2.00	0.000037 g	0.037 %
1.00000 g	1.00000 g	0.00000 g	2.00	0.000037 g	0.0037 %
5.00002 g	5.00002 g	0.00000 g	2.00	0.000050 g	0.0010 %
20.00002 g	20.00002 g	0.00000 g	2.00	0.000069 g	0.00034 %
50.00004 g	50.00003 g	-0.00001 g	2.00	0.00017 g	0.00031 %
70.00000 g	70.00000 g	0.00000 g	2.00	0.00017 g	0.00024 %
90.00001 g	90.00001 g	0.00000 g	2.00	0.00019 g	0.00021 %
100.00000 g	100.00000 g	0.00000 g	2.00	0.00017 g	0.00017 %
110.00000 g	110.00000 g	0.00000 g	2.00	0.00020 g	0.00025 %
120.00000 g	120.00000 g	0.00000 g	2.00	0.00020 g	0.00023 %
Maximum error of indication   E <sub>max</sub> = 0.00010 g					

U<sub>ref</sub> is the quotient of U<sub>ref</sub> and test load. The uncertainty of measurement U<sub>ref</sub> 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. The uncertainty of measurement is calculated by the expansion factor, determined in accordance with the European Calibration Guidelines (EURAMET) cg-18, V4.0. There is a 95 % probability that the value of the measurement will be in the expanded value range.

## End of calibration certificate

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## Interpretation of measurement results | Appendix to the calibration certificate

## Uncertainty of measurement in use

Device adjusted before measurement Yes

Temperature deviation considered 1.5 K (ISO CAL active)

Temperature coefficient considered 1 · 10<sup>-4</sup> /KUncertainty of the weighing result U<sub>0</sub>(W)

Partial weighing range 1 | 0.00003 g - 60.00000 g

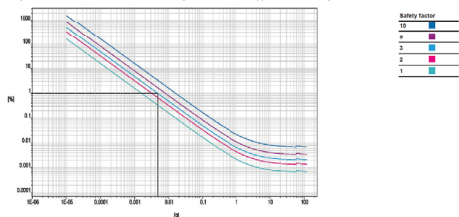
Partial weighing range 2 | 60.00000 g - 120.00000 g

U<sub>0</sub>(W) = 0.000016 g + 6.61 · 10<sup>-4</sup> · RU<sub>0</sub>(W) = 0.000086 g + 6.19 · 10<sup>-4</sup> · R

Referred only: The stated uncertainty of measurement is calculated by utilizing the following 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 expanded factor of k, determined in accordance with the European Calibration Guidelines (EURAMET) cg-18, V4.0. There is a 95 % probability that the value of the measurement will be in the expanded value range.

Indication in % from Max	Net indication	Uncertainty	Uncertainty relative
1 %	0.00000 g	0.000020 g	0.0003 %
25 %	15.00000 g	0.00012 g	0.0007 %
50 %	30.00000 g	0.00021 g	0.0007 %
75 %	45.00000 g	0.00031 g	0.0007 %
100 %	60.00000 g	0.00041 g	0.0009 %

## Graphic realization of the relative uncertainty of measurement | process accuracy



## Displayed example

Process accuracy 1.00 %

Safety factor 3

Minimum sample weight 0.00474 g

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & 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.: 25CH847

Page: 1 of 3

Equipment:	pH Meter
Manufacturer:	Mettler Toledo
Model:	SevenCompact S220
Serial No.:	C104059480
ID No.:	RYG_EN0183
Condition As-Received:	Used Item
Received Date:	17 July 2025
Calibration Date:	18 July 2025
Reference:	2507-0561DSC-3
Submitted by:	ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch 616/10 Moo 5, T. Maenam Khu, A.Puakdaeng, Rayong 21140, Thailand

Ambient Temperature: (25 ± 2.5) °C  
Relative Humidity: (50 ± 15) %  
In-house method:  
- CP-CH6 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)  
- CP-CH9 by comparison with temperature standard

Calibrated by: Walailak Sirinthean

Approved by: Sathap

Issue Date: 21 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 &amp; Equipment Calibration and Testing Services.



## Condition of this calibration result

## 1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54020048	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	3240708	60RC033	263284	01 Apr 2026

- 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.

ANHS-ASQ National Accreditation Board, Accredited No. AN-1935

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

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

## Calibration Results

## Summary: pH Measurement

Performing standard curve by Document Process Calibrator at pH (4.7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage factor
	pH	mV	mV	(mV)	k
pH Meter	4.000	177.48	177.3	0.058	2.00
SIN: C104059480	7.000	0.00	-0.2	0.058	2.00
	10.000	-177.48	-177.6	0.058	2.00



Cert. No.: 25CH847

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	Uncertainty of pH Measurement	Coverage factor
pH Electrode	4.007	4.008	164.6	0.0044	2.00
SIN: S240606	6.965	6.966	10.2	0.0084	2.00
	10.010	10.009	-164.9	0.0065	2.00

## Function: Temperature Measurement

## (\*) Without adjustment

This equipment was connected with Temperature Probe:

- Model: InLabExpert Pro-ISM

- Serial No.: S240606

- Dimension of probe

- Length: 120 mm

- Diameter: 12 mm

- Immersion Depth: 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.001	25.0	-0.001	0.13	2.00

Remark: - UUC\* = Unit Under Calibration

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



## Certificate of Calibration

Certificate No.: 25E2372

Page: 1 of 2

Equipment:	pH Meter
Manufacturer:	Mettler Toledo
Model:	SevenCompact S220
Serial No.:	C104059480
ID No.:	RYG_EN0183
Condition As-Received:	Used Item
Received Date:	17 July 2025
Calibration Date:	22 July 2025
Reference:	2507-0561DSC
Ambient Temperature:	(23 ± 2) °C
Relative Humidity:	(50 ± 10) %
Submitted by:	ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch 616/10 Moo 5, T. Maenam Khu, A.Puakdaeng, Rayong 21140, Thailand

Procedure used: Calibration were conducted using calibration procedure No. CP-E17 according to EURAMET cg-18.

## Condition of this result of calibration

## 1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	6300A	631011	25E1627	19 May 2028

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-ONSAC Accredited No. Calibration 0008

Calibrated by: Nopachon Prasomsasri

Issue Date: 23 July 2025

Approved Signature:

[ ] Phatinee Pratsaporn

[ ] Nuntawat Khomchai

[ ] Pongsang Boonyaporn





## 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. Phukdaeng,  
Rayong 21140, Thailand

Location : TPA On Site Calibration Laboratory

Received Order : 17 January 2025

Calibrated Date : 20 January 2025

Ambient Temperature : (28 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lemgagrakul

Approved by :

( ) Chakrit Waewwanjua  
(✓) Suwit Inga  
( ) Kunchit Promrat

Issue Date : 23 January 2025

The Uncertainties are for a confidence probability of approximately 95%

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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) in Temperature Bath.  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument-

Instrument Serial No. Cert. No. Traceability Due Date  
1) Digital Thermometer 2180000 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: 15E100484

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor
20.00	60	20.002	18.81	-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 %.

-00-



## 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. Phukdaeng,  
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 : Watlak Sirinthan

Approved by :

( ) Ponthipai Tamayakul  
( ) Pongpan Palpin  
(✓) Sathip 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).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	1308U10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

Material	Manufacturer	Lot No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMALUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No.: 15E100484

Titration Method (Azide Modification Method)	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

-00-



## Certificate of Calibration

Cert. No.: 24TM1663  
Page: 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG\_EN0154

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch  
616/10 Moo 5, T. Maenam Khu,  
A. Phukdaeng,  
Rayong 21140, Thailand  
BOD Room

Location :

Received Order : 01 November 2024

Calibration Date : 01 November 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Kridsa Malee

Approved by :

( ) Pongpan Palpin  
( ) Suwit Inga  
(✓) Kunchit Promrat

Issue Date : 07 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Low Temp. Incubator  
Condition As-Received : Used Item  
Reference : 2411-0002OC-1

Cert. No.: 24TM1663  
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-

Instrument Serial No. Cert. No. Traceability Due Date  
1) Data Acquisition MY44073381 24LM73 TPA 18 May 2025

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

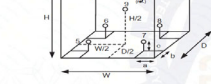
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (°) Without Adjustment

Function of UUC : Temperature Source

Fresh air setting : Close



Probe Installation Details :

a = 10 cm  
b = 10 cm  
c = 10 cm

Dimension of Chamber :

D = 0.80 m  
W = 1.0 m  
H = 1.2 m  
Capacity = 0.72 m<sup>3</sup>

Environment during calibration		
Temp. (°C)	Beginning	Finished
REL Humid. (%)	24	25
PC Supply (V/AH)	55	53
	220	221
Position		
Ref. Std. ID No.	Position	Ref. Std. ID No.
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9 (ref.)	9	9



Equipment : Low Temp. Incubator  
Condition As-Received : Used Item  
Reference : 2411-0002OC-1  
Result of Calibration :- (°) Without Adjustment  
Function of UUC : Temperature Source  
Fresh air setting : Close

Cert. No.: 24TM1663  
Page: 3 of 3

Calibration Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
20.0	20.0	20.0	0.026	1.26	6.53	2

Measured Temperature (°C)										Uncertainty (± °C)
Point (°C)	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.071	19.915	20.273	20.179	19.977	19.782	20.056	20.026	20.033	0.30

Average\* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

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

UUC\* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

-00-



## Certificate of Calibration

Cert.No.: 25CG3688  
Page: 1 of 2

Equipment : Burette

Capacity : 50 mL

Serial No. : -

ID No. : RYG\_EN0216

Manufacturer : Wittig

Made in : Germany

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
Rayong Branch  
616/10 Moo 5, T. MaenamKoo, A. Phukdaeng,  
Rayong 21140, Thailand

Ambient Temperature : (26 ± 2.5) °C

Relative Humidity : (50 ± 10) %

Barometric Pressure : 733 mmHg

Calibration Procedure : ASTM E 542- 01

Calibrated by : Sriracha Khemfha

Approved by :

( ) Pongpan Palpin  
(✓) Chakrit Waewwanjua

Issue Date : 10 September 2025

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Burette  
Received Date : 16 September 2025  
Condition As-Received : Used Item  
Calibration Date : 16 September 2025  
Reference : 2509-0554DSC-3

Cert.No.: 25CG3688  
Page: 2 of 2

### Condition of this result of calibration

1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID No.	Certificate No.	Traceability	Due date
1) Balance	XP205	B134200712	140RC007	25MM2096	TPA	16 July 2026
2) Handheld/Baro Temp	MHB 3825D	AM42259	140EC018	25H16165	TPA	14 Aug 2026
3) Digital Thermometer	H4010	238880555	140EC013	25H1740	TPA	17 Jan 2026

This measurement result is traceable to SI Unit

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

3. True value is converted to true volume at the standard temperature of 20 °C

### Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
10	10.0254	0.0082	2.00
25	25.0141	0.0087	2.00
50	49.9952	0.010	2.00

Remark mL = cm<sup>3</sup>

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 %.

-00-





Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration : 20 Feb 2025

Temperature at place of calibration | Temp. diff. : 24.7 °C | 0.3 K

Measuring conditions : The installation site is suitable. The device was leveled. Balance was loaded up to Max by test.

Comments : Humidity 62.3 %RH.

Measurement results | Measurement uncertainties

Repeatability	Eccentricity
Test load (nominal): 10 g   200 g	Test load (nominal): 100 g
1 10.0000 g 200.0000 g	Center 100.0000 g
2 10.0000 g 200.0000 g	Front left 100.0000 g
3 10.0000 g 200.0000 g	Back left 100.0000 g
4 10.0000 g 200.0000 g	Back right 99.9999 g
5 10.0000 g 200.0000 g	Front right 99.9999 g
6 10.0000 g 200.0000 g	Maximum deviation from centric loading indication (Microline = 0.0001 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	
	$\sigma = 0.00004 \text{ g}$ $\sigma = 0.00005 \text{ g}$

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
0.0100 g	0.0100 g	0.0000 g	2.00	0.00013 g	1.3 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.026 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00013 g	0.0026 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00013 g	0.0013 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00068 %
50.0000 g	50.0000 g	0.0000 g	2.00	0.00014 g	0.00028 %
100.0000 g	100.0000 g	0.0001 g	2.00	0.00018 g	0.00018 %
200.0000 g	200.0000 g	0.0001 g	2.00	0.00020 g	0.00014 %
220.0000 g	220.0000 g	0.0000 g	2.00	0.00013 g	0.00013 %

Maximum error of indication :  $\pm 0.0001 \text{ g}$

End of calibration certificate

Uncertainty of measurement in use

Device adjusted before measurement : Yes

Temperature deviation considered : 1.5 K (ISO/CAL active)

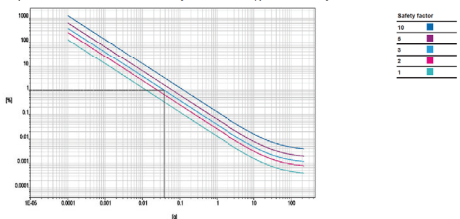
Temperature coefficient considered :  $1 \cdot 10^{-4} \text{ }^{\circ}\text{K}$

Uncertainty of the weighing result  $U_p(W)$  :  $U_p(W) = 0.00013 \text{ g} + 3.42 \cdot 10^{-4} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering the reading R into this formula. In relation to this, there is no need for a Expansion factor of 2 determined in accordance with the European Calibration Guideline EURAMET-19-19-14. There is a 95 % probability that the value of the indicated result is in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_p(W)$	Uncertainty relative $U_p(W)/R$
1 %	2.0000 g	0.00014 g	0.0070 %
25 %	55.0000 g	0.00013 g	0.0002 %
50 %	110.0000 g	0.00013 g	0.0001 %
75 %	165.0000 g	0.00013 g	0.0001 %
100 %	220.0000 g	0.00013 g	0.0001 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example : 1.00 %

Process accuracy : 0.380

Safety factor : 0.0380

Minimum sample weight : 0.0380 g

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 Nakkarned (Site Calibration Manager)  
Approved By : Dr. S. / 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.

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 used 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.

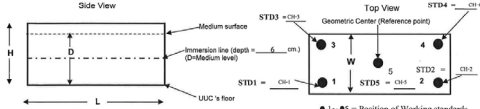
Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M18 (CHI-CH5)	T325158	17 October 2026
DATA LOGGER	34970A	T261	T3251758	17 October 2026

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 : [Signature]



D = Medium level : 12 cm.  
UUC's medium : Water  
Working standards are located at 2.5 cm. away from each corner and walls.

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

Setting (°C)	Reading (°C)		Average (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)	Coverage Factor k
	Min	Max					
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 excludes "uniformity"  
The calibration result apply only the where 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 : [Signature]

Equipment : SPECTROPHOTOMETER  
Model : DR6000  
Serial No. (or ID.) : 1027945 (RYG\_EN0037)  
Manufacturer : HACH  
Condition : In Condition

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

Calibration By : Mr. Preecha Phooasri  
Calibration Date : 18 March 2025  
The Method used : In house method, CAL-WI-24, based on ASTM E 275-08 and ASTM E 387-04  
This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Sigma Scientific Limited.  
The standard for Wavelength Certificate No. 111593 and 111594  
The standard for Photometric Certificate No. 9114984 and 111598  
The standard for Stray light Certificate No. 111596 and 111595  
The standard for Spectral resolution Certificate No. 111597

Person in charge : (Mr. Preecha Phooasri)  
Authorized signatory : (Miss Kaewkan Sunadach)  
This certificate is issued for the use 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 related to the expected 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.  
Delivering Growth - In Asia and Beyond.

Calibration Results: Without Adjustment

Wavelength Accuracy (nm)	The spectral bandwidth of 864 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		
637.86	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)	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.300	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
	0.0000	0.300	0.0000	0.0045
	0.2847	0.285	-0.0017	0.0045
	0.5073	0.508	-0.0007	0.0045
	1.0083	1.009	-0.0007	0.0045
	0.0000	0.300	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
	0.0000	0.300	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
	0.0000	0.300	0.0000	0.0045
	0.2894	0.289	0.0004	0.0045
	0.5040	0.505	-0.0010	0.0045
	1.0032	1.004	-0.0008	0.0045
	0.0000	0.300	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)	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.300	0.0000	0.0080
	0.7355	0.738	-0.0025	0.0080
257 nm	0.0000	0.300	0.0000	0.0080
	0.8574	0.857	0.0004	0.0080
313 nm	0.0000	0.300	0.0000	0.0080
	0.2864	0.290	-0.0036	0.0080
350 nm	0.0000	0.300	0.0000	0.0080
	0.6374	0.637	0.0004	0.0080

Stray light *	UUC: Wavelength (nm)	UUC: Transmission (%)	Absorbance (A)
Standard: cut-off	260.62 ± 0.11 nm	260.6	1.7
	391.44 ± 0.11 nm	391.4	1.4

Spectral Resolution *	Nominal Concentration 0.02 % w/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.66	268.69	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

Calibration Results: Without Adjustment

Wavelength Accuracy (nm)	The spectral bandwidth of 864 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		
637.86	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)	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.300	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
	0.0000	0.300	0.0000	0.0045
	0.2847	0.285	-0.0017	0.0045
	0.5073	0.508	-0.0007	0.0045
	1.0083	1.009	-0.0007	0.0045
	0.0000	0.300	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
	0.0000	0.300	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
	0.0000	0.300	0.0000	0.0045
	0.2894	0.289	0.0004	0.0045
	0.5040	0.505	-0.0010	0.0045
	1.0032	1.004	-0.0008	0.0045
	0.0000	0.300	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 Marked "Not TISI Accredited" in this Certificate have been included for completeness.

The End of Certificate





## Certificate of Calibration

Cert.No.: 25CH579  
Page: 1 of 3

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : SevenGo S2  
Serial No. : B851952376  
ID No. : RYG\_FS0425  
Condition As-Received : Used Item  
Received Date : 19 May 2025  
Calibration Date : 20 May 2025  
Reference : 2505-0527DSC-1  
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-CH5 by comparison with temperature standard

Calibrated by : Warakorn Lermgagrakul  
Approved by : *Sathip*  
Approved Signatory

( ) Chakrit Wawwanjua  
( ) Ponpan Palpin  
(✓) Sathip Meungmal  
Issue Date : 22 May 2025

The uncertainties are for a confidence probability of approximately 95%  
This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



## Condition of this calibration result

### 1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	5403049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4862054	110RC044	24757	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 Lange GmbH Ltd., Deutsche Akkreditierungsstelle, Accredited No.D-RM-15194-01-00  
- The measurement results are traceable to SI through CPA chem Ltd., ANSL-ASQ National Accreditation Board, Accredited No. AB-1635

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1066655	19 Jan 2027
pH 7.000	Hach Lange GmbH	C03232	02 Dec 2026
pH 10.010	CPA chem	1066659	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	Actual Reading	Uncertainty of Measurement	Coverage factor
		Input	mV	(mV)	k
pH Meter	4.00	177.48	178	4.00	0.58
SN: B851952376	7.00	0.00	0	7.00	0.58
	10.00	-177.48	-178	10.00	0.58

Cert.No.: 25CH579  
Page: 2 of 3



## Calibration Results

### Function : pH Measurement

#### Performing three buffers standard curve by using buffer nominal pH (4.7,10)

Unit Under Calibration	Standard Solution	Actual pH Reading	Actual mV Reading	Uncertainty of pH Measurement	Coverage factor
pH Electrode	4.007	4.01	154	0.0071	2.00
SN: 3295238	7.000	7.00	-10	0.0095	2.00
	10.010	10.01	-182	0.0095	2.00

### Function : Temperature Measurement

#### (\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab®Expert Go-ISM

- Serial No. : 3293238

Dimension of probe

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.2	0.198	0.13	2.00
45.0	45.005	45.2	0.195	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 %.

-00-



Certificate No. T252167  
Certificate of Calibration  
Page 1 of 4

Equipment : Chamber ( Cold Room )  
Manufacturer : MODULAR  
Model : IREVOCHCOO  
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 Nakanakred ( Site Calibration Manager )  
Approved By : *Booncha* / Booncha Suriyayong ( 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.

FM-TL06 10227-03-08



Certificate No. T252167  
Calibration Report  
Page 2 of 4

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

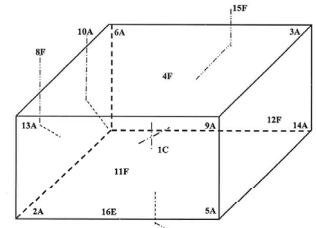
5. Adjustment :  
( ) without adjustment ( X ) after adjustment

Approved By : *Prada*

FM-TL07 10227-03-08



Certificate No. T252167  
Calibration Report  
Page 3 of 4



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

1C = TN161	11F = TN171
2A = TN162	12F = TN172
3A = TN163	13A = TN173
4F = TN164	14A = TN174
5A = TN165	15F = TN175
6A = TN166	16E = TN176
7F = TN167	
8F = TN168	
9A = TN169	
10A = TN170	

Approved By : *Prada*

FM-TL07 10227-03-08



Certificate No. T252167  
Calibration Report  
Page 4 of 4

### Measurement Results:

#### Average Standard Reading at each position (°C)

Calibration Point	1C	2A	3A	4F	5A	6A	7F	8F	9A	10A
3	2.59	2.80	2.94	2.86	3.05	3.44	3.11	3.30	3.28	3.46
	11F	12F	13A	14A	15F	16E				
	3.41	3.56	3.38	3.94	3.36	3.56				

Chamber ( Cold Room )		Temperature Distribution					Coverage Factor k
Setting (°C)	Min	Max	Average (°C)	Stability(±°C)	Uniformity(°C)	Uncertainty(±°C)	
3.0	2.9	4.1	3.7	3.21	1.25	1.82	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 : *Prada*

FM-TL07 10227-03-08

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Agilent CrossLab Compliance Services

## Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: BKK\_EN0058(GM-7)  
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.  
Organization Location: 104 Pathanakarn 40, Pathanakarn Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok

Date: June 25, 2025 8:40:18 PM  
EOP Name: Agilent/Recommended, Agilent/Recommended

EOP Revision: GC 02.50, GCMS 02.50

Overall Qualification Status: Pass

System Inspection and Basic Safety and Operation

Name: 7890  
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890  
Front: SSL

Setpoint Status: Pass

Inlet Pressure: 35.0 psi

Accuracy: 0.2 psi

Agilent Recommended: <= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Date: June 25, 2025 8:40:18 PM  
System ID: BKK\_EN0058(GM-7)

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Agilent CrossLab Compliance Services

Name: 7890

Setpoint Status: Pass

Zone: Oven

Temperature: 230.0 228.8 °C

Accuracy: -1.2 °C

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

Setpoint Status: Pass

Zone: Oven

Temperature: 100.0 100.8 °C

Accuracy: 0.8 °C

Agilent Recommended: >= -1.9 % 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: 100.0 101.0 °C

Stability: 0.0 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1: Front: SSL / External: SQ

Name: 5977A

Date: June 25, 2025 8:40:18 PM  
System ID: BKK\_EN0058(GM-7)



Date: June 26, 2025 8:40:18 PM  
System ID: BKK\_EN0059(GM-7)  
Page: 2 / 16

Date: June 25, 2025 8:40:18 PM  
System ID: BKK\_EN0059(GM-7)

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Date: June 25, 2025 8:40:18 PM  
System ID: BICK\_EN0069(GM-7)

Date: June 25, 2025 8:40:18 PM  
System ID: BKK\_EN0059(GM-7)  
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Date: June 25, 2025 8:42:18 PM  
System ID: BKK\_EN0059(GM-7)

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Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GC#11\_CN2303A021\_OQ

Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GC#11\_CN2303A021\_OQ

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Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GC#11\_CN2303A021\_OQ

<b>Agilent CrossLab Compliance Services</b>			
<b>Setup Status:</b>	Completed		
Injection Volume on Column:	1.0 µL		
<b>Overall Scouting Run Status</b>			
Completed			
<b>Notes and Drift</b>			
<b>Tested Combination 1</b>	Front	SSL	/ Front FID
Name:	8890		
<b>Setup Status:</b>	Pass		
Base Signal:	5.89 pA		
	ASTM Noise	Drift	
	pA	pA/h	
	0.05	1.11	
Agent Recommended:	<=	0.10	<= 2.50
Status:	Pass		Pass
<b>Overall Noise and Drift Test Status</b>			
Pass			
<b>Injection Precision</b>			
<b>Tested Combination 1</b>	Front	SSL	/ Front FID
Name:	7693A		
<b>Setup Status:</b>	Pass		
Injection Volume on Column:	1.0 µL		
Area RSD:	0.06 %	Retention Time RSD:	0.19 %
Agent Recommended:	<= 3.00		<= 1.00
<b>Overall Injection Precision Test Status</b>			
Pass			
<b>Signal to Noise</b>			

Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_OGA11\_CN2303AQ21\_QQ

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2025 by Agilent Technologies

Agilent CrossLab Compliance Services

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination	2	Back	SSL	/	Back	FID
Name:	7693A					
Seipoint Status:	Pass					
Injection Volume on Column:	1.0	ul.				
Area RSD:	0.52	%		Retention Time RSD:	0.23	%
Agilent Recommended:	<=	3.00			<=	1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination	2	Back	SSL	/	Back	FID
Name:	Injection Tower 8890					
Seipoint Status:	Pass					
Signal to Noise:	837739					
Agilent Recommended:	>= 300000					

Overall Signal to Noise Test Status

Pass

Date: May 9, 2025 11:22:14 AM

System ID: 2025\_AILS\_OCR1\_L\_ON2303M021\_OQ

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2025 by <a href="#">Apigent Technologies</a>		<a href="#">Apigent CrossLab Compliance System</a>
<h2>Instrument Details</h2>		
<b>Purpose</b>		
This section describes the as found system configuration.		
<b>Details</b>		
<b>System</b>		
System ID	2025_ALS_OGH1_1_CH2030A021_OGHW	
Manufacturer	Apigent Technologies	
Name	8880	
Flow Data Input	Manual Data	
Temperature Data Input	Manual Data or Other Data Logging	
<b>Tested Combination 1</b>		
Injection Technique	Injection Tower	
Sampler Identifier	Sampler 1	
Inlet	Front	
Detector	Front	
LTM Included?	No	
<b>Tested Combination 2</b>		
Injection Technique	Injection Tower	
Sampler Identifier	Sampler 2	
Inlet	Back	
Detector	Back	
LTM Included?	No	
<b>Sampler 1</b>		
Manufacturer	Apigent Technologies	
Type	Injection Tower	
Name	7693A	
Model Number	G4513A	
Serial Number	CN23125107	
Firmware Revision	A.11.07	
Usage	Sample Injection	
Location	Front	
Syringe Volume (µL)	10	

2025 by Agilent Technologies		Agilent CrossLab Compliance Services
Sampler 2		
Manufacturer	Agilent Technologies	
Type	Injection Tower	
Name	7893A	
Model Number	G4513A	
Serial Number	CN23125121	
Firmware Revision	A.11.07	
Usage	Sample Injection	
Location	Back	
Syringe Volume (µL)	10	
Sampler 3		
Manufacturer	Agilent Technologies	
Type	Tray	
Name	7893A	
Model Number	G4514A	
Serial Number	CN2314054	
Firmware Revision	A.12.03	
Vial Heater	Not installed	
Mainframe 1		
Manufacturer	Agilent Technologies	
Name	8890	
Model Number	Q3540A	
Serial Number	CN2303A021	
Firmware Revision	3.0.3.21	
Oven Type	Standard	

---

Date:

May 6, 2025 11:32:14 AM

System ID:

2025\_AL9\_GCH1\_CN2303M021\_OQ

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2025 by Agilent Technologies		Agilent CrossLab Compliance System			
Inlet 1					
Manufacturer	Agilent Technologies				
Name	8890				
Type	SSL				
Location	Front				
Carrier Gas	Helium				
Control Type	Electronic Pressure Control (EPC)				
Purged Inlet	Yes				
Inlet 2					
Manufacturer	Agilent Technologies				
Name	8890				
Type	SSL				
Location	Back				
Carrier Gas	Helium				
Control Type	Electronic Pressure Control (EPC)				
Purged Inlet	Yes				
Detector 1					
Manufacturer	Agilent Technologies				
Name	8890				
Type	FID				
Adapter	Capillary				
Control Type	Electronic Pressure Control (EPC)				
Location	Front				
Makeup Gas	Nitrogen				
Detector 2					
Manufacturer	Agilent Technologies				
Name	8890				
Type	FID				
Adapter	Capillary				
Control Type	Electronic Pressure Control (EPC)				
Location	Back				
Makeup Gas	Nitrogen				

# Electronic Signature

## Purpose

This signature page 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 statement understands the meaning and legal status of an electronic signature. As a trained official signer, the Agilent representative has a unique password and login 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:	Saengyuth Tanak
Logged On User Name:	saengyuth.tanak@non.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 document passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location `SDB\CleanStore\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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Date:	May 9, 2025 11:32:14 AM
Page ID:	2025_ACE_SELF_Q0011_0263293261_00

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2025 by Agilent Technologies

Agilent CrossLab Compliance System

User Name: saangju@nls.ac.kr

System ID: 2025\_ALS\_G011\_CNC203AL021\_OQM

Report Generated by Hostname: LAPTOP-GQ33B0CMW

Print Date: May 9, 2025 11:32:16 AM

2025\_ALS\_G011\_CNC203AL021\_OQM Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 1:49:44 PM	Auth	Session Created	Session	Host Name: LAPTOP-GQ33B0CMW; Oem Serial Number: 644D64A
May 9, 2025 1:49:44 PM	start	Configuration	Session	None
May 9, 2025 1:49:44 PM	Auth	Enrollment	Licensing	User ID Mapping and does not require an unlock code
May 9, 2025 1:56:00 PM	Auth	Eqpt. loaded	Session	EQP details for primary instrument: [20] + File path: (PhotoshopsCoreConfigure) [new025040203AL021] EQP ID Name: (AgilentEQName) EQP Name: (AgilentRecommendedPhoto) and Hostname: (StuLS016)
May 9, 2025 1:56:02 PM	End	Configuration	Session	None
May 9, 2025 1:56:03 PM	start	Qualification	Session	PM
May 9, 2025 1:56:10 PM	start	Qualification	Session	CG
May 9, 2025 1:56:10 PM	start	Execution	System Inspection - 8890 -	None
May 9, 2025 1:56:45 PM	End	Execution	System Inspection - 8890 -	Run Count: 1
May 9, 2025 1:56:47 PM	start	Execution	Maintenance	Maintenance - 8890 -
May 9, 2025 1:56:56 PM	End	Execution	Maintenance - 8890 -	Run Count: 1
May 9, 2025 1:56:56 PM	start	Execution	Maintenance - Front S&L -	Maintenance: 8890
May 9, 2025 1:57:02 PM	End	Execution	Maintenance - Front S&L -	Run Count: 1
			Maintenance - 8890	

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Date: May 9, 2025 11:32:16 AM

System ID: 2025\_ALS\_G011\_CNC203AL021\_OQ

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User Name: sempg@mc.clark  
 Report Generated by: Historian - LAFON@mc.clark

System Name: ASML\_GSG1\_CNDGMSH\_02QW  
 Print Date: May 8, 2025 13:20:48 AM

**2025-04-15 ASML\_GSG1\_CNDGMSH\_02QW Transaction log:**

Time	Transaction Status	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:04 PM	End	Execution	<b>EW Pressure Entry - Back</b> Run Count: 1 SD: - Pressure Controlled Back → 35.0 psi-L → -0.2 psi and → 0.3 psi	
May 8, 2025 2:17:06 PM	Start	Execution	<b>EW Pressure Authority - Back</b> None SD: - Pressure Controlled Back → 35.0 psi-L → -0.2 psi	
May 8, 2025 2:18:01 PM	End	Execution	<b>EW Pressure Authority - Back</b> Run Count: 1 SD: - Pressure Controlled Back → 35.0 psi-L → -0.2 psi	
May 8, 2025 2:18:04 PM	Start	Execution	<b>Deflector Flow Authority - Front</b> None FE: - Type: Front - 0.50 mchm-L → 10.0% setpoint	
May 8, 2025 2:18:27 PM	Auth	Data	<b>Deflector Flow Authority - Front</b> Manual Data Entry FE: - Type: Front - 0.50 mchm-L → 10.0% setpoint	
May 8, 2025 2:18:30 PM	End	Execution	<b>Deflector Flow Authority - Front</b> Run Count: 1 FE: - Type: Front - 0.50 mchm-L → 10.0% setpoint	
May 8, 2025 2:19:32 PM	Start	Execution	<b>Deflector Flow Authority - Front</b> None FE: - Type: Outback - 0.000 mchm-L → 10.0% setpoint	
May 8, 2025 2:19:54 PM	Auth	Data	<b>Deflector Flow Authority - Front</b> Manual Data Entry FE: - Type: Outback - 0.000 mchm-L → 10.0% setpoint	
May 8, 2025 2:19:56 PM	End	Execution	<b>Deflector Flow Authority - Front</b> Run Count: 1 FE: - Type: Outback - 0.000 mchm-L → 10.0% setpoint	
May 8, 2025 2:19:58 PM	Start	Execution	<b>Deflector Flow Authority - Front</b> None FE: - Type: Mainback - 0.250 mchm-L → 10.0% setpoint	

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Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GC#11\_CN2303A021\_OC

User Name: [sawapal@uic.edu](#)

Report Generated by Instance: [BCL\\_G0030000H](#)

System ID: [BCL\\_AIS\\_G011\\_G02030002\\_0209H](#)

Print Date: May 8, 2020 11:32:10 AM

2020\_AIS\_G011\_G02030002\_0209H Transaction Log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2020 8:31:12 PM	Start	Execution	OC Binding Run - Injection	None
			Team: Front BSL, Front FPD -	
			Part of System Preparation - No	
			Items associated	
May 8, 2020 8:31:39 PM	Abort	AutoClosed	Session	None
May 8, 2020 8:32:28 AM	Abort	AutoRefreshed	Session	None
			Team: LARF-G0030000H, Other	
			LARF-Form: SAKSD00A	
May 9, 2020 8:32:30 AM	Abort	SessionRefreshed	Session	None
May 9, 2020 8:32:40 AM	Abort	Qualification	Session	PM
May 9, 2020 8:32:46 AM	Abort	Qualification	Session	OQ
May 9, 2020 8:32:46 AM	Start	Execution	OC Binding Run - Injection	None
			Team: Front BSL, Front FPD -	
			Part of System Preparation - No	
			Items associated	
May 9, 2020 8:34:41 AM	Abort	UWB	UWB Isolating Run - Injection	UWB Run FBD1 -
			Team: Front SSL, Front FPD -	
			Part of System Preparation - No	
			Items associated	
			F100202502awOCGG-Ln	
			W022_Fwdm_Sc7_Fn	
			Items associated	
May 9, 2020 8:34:55 AM	Abort	Reporting	RetestIntegration	RetestIntegration Count: 1 -
			Integration Type:	
			Injection/Random Connection	
			Mode: AdvancedGlobal Slope	
			Sensitivity: 10.0 dBm RMS	
			Width: 0.251 MHz	
			Report: GlobalRange Request	
			UWB Integration: On or	
			OR Integration: On or	
			SL Integration: On or	
			SL Integration: On or	
May 9, 2020 8:39:11 AM	End	Execution	OC Binding Run - Injection	Run Count: 1
			Team: Front BSL, Front FPD -	
			Part of System Preparation - No	
			Items associated	

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Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GC#11\_CN2303A021\_OC

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
<div> <div>Report Generated by Hostname: LAPF02-023040W6</div> <div> <div>System: 2012_AIS_GSM1_CDR20120501_QDRW</div> <div>Print Date: May 9, 2012 13:10:18 AM</div> </div> </div>				
2012_AIS_GSM1_CDR20120501_QDRW Transaction Log:				
May 9, 2012 9:32:27 AM	Abail	Reporting	Reintegration	<div>Reintegration Count: 1</div> <div>Integration Type: Integrated</div> <div>Integration Direction: Command</div> <div>Mode: Advanced 32-Bit Slope</div> <div>Sensitivity: 13.8 dBm Peak</div> <div>Width: 0.21-Broad Area</div> <div>Report: Commanding Report</div> <div>100 Integration: Off</div> <div>Integration: On at 0.15 Integration: Off 0.5.1</div>
May 9, 2012 9:33:34 AM	End	Execution	Signal to Noise - Injection Tower, Front SBL, Front FED - Detector FED - => 300000	Run Count: 1
May 9, 2012 9:35:59 AM	Start	Execution	GC Sounding Rack - Injection Tower, Back SBL, Back FED - Part of System Preparation - No limits associated	None
May 9, 2012 9:46:40 AM	Abail	Data	GC Sounding Rack - Injection Tower, Back SBL, Back FED - Limits associated	Data File Path: F:\0203512Data\000000 Part of System Preparation -> 11_Sound_H2=0000_Sound_k_a2Cdr
May 9, 2012 9:46:57 AM	End	Execution	GC Sounding Rack - Injection Tower, Back SBL, Back FED - Part of System Preparation - No limits associated	Run Count: 1
May 9, 2012 9:47:00 AM	Start	Execution	Noise and DRT- Back FED - Detector FED - 1 (Noise) => 5.15 dB (a) (DRT) => 2.50 pW/m2	None
May 9, 2012 10:51:05 AM	Abail	Data	Noise and DRT- Back FED - Detector FED - 1 (Noise) => 5.15 dB (a) (DRT) => 2.50 pW/m2	Data File Path: F:\0203512Data\000000 11_Sound_H2=0000_Sound_k_a2Cdr

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Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GC#11\_CN2303A021\_OC

User Name: saengthai.2005  
Report Generated by Hostname: LAPTOP-G358K0M7  
Print Date: May 9, 2025 11:32:14 AM

System No.: 2025\_ALS\_GCH11\_CN2030A021\_Q00W

2025\_ALS\_GCH11\_CN2030A021\_Q00W Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 10:51:12 AM	End	Execution	Noise and Shift-Back FID -> Detector FID-1 Noise <-> 5.19 pH-L (DMS) <-> 2.80 pH-Hist	Run Count: 1
May 9, 2025 10:51:16 AM	Start	Execution	Injection Precision - Injection Tower, Back SSI, Back FID -> GC -L (HMS) <-> 3.02% -L (RM, Time) <-> 1.02%	None
May 9, 2025 11:09:34 AM	Auto	Data	Injection Precision - Injection Tower, Back SSI, Back FID -> FID00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%	Data File Path: F:\00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%
May 9, 2025 11:09:34 AM	Auto	Data	Injection Precision - Injection Tower, Back SSI, Back FID -> FID00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%	Data File Path: F:\00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%
May 9, 2025 11:09:34 AM	Auto	Data	Injection Precision - Injection Tower, Back SSI, Back FID -> FID00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%	Data File Path: F:\00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%
May 9, 2025 11:09:34 AM	Auto	Data	Injection Precision - Injection Tower, Back SSI, Back FID -> FID00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%	Data File Path: F:\00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%
May 9, 2025 11:09:34 AM	Auto	Data	Injection Precision - Injection Tower, Back SSI, Back FID -> FID00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%	Data File Path: F:\00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%

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Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GCH11\_CN2030A021\_Q0

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User Name: saengthai.2005  
Report Generated by Hostname: LAPTOP-G358K0M7  
Print Date: May 9, 2025 11:32:14 AM

System No.: 2025\_ALS\_GCH11\_CN2030A021\_Q00W

2025\_ALS\_GCH11\_CN2030A021\_Q00W Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 11:09:46 AM	End	Execution	Injection Precision - Injection Tower, Back SSI, Back FID -> GC -L (HMS) <-> 3.02% -L (RM, Time) <-> 1.02%	Run Count: 1
May 9, 2025 11:09:49 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSI, Back FID -> Detector FID -L <-> 200000	None
May 9, 2025 11:09:51 AM	Auto	Data	Signal to Noise - Injection Tower, Back SSI, Back FID -> FID00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%	Data File Path: F:\00200000000000000000 GC -L (HMS) <-> 3.02% -L <-> 1.02% (RM, Time) <-> 1.02%
May 9, 2025 11:07:07 AM	End	Execution	Signal to Noise - Injection Tower, Back SSI, Back FID -> Detector FID -L <-> 200000	Run Count: 1
May 9, 2025 11:07:11 AM	End	Qualification	Session	OQ
May 9, 2025 11:07:11 AM	Start	Reporting	Session	None
May 9, 2025 11:06:47 AM	Auto	Reporting	Session	Report Generated: Report
May 9, 2025 11:06:23 AM	Auto	Reporting	Session	Report Signal: Report
May 9, 2025 11:06:23 AM	Auto	Reporting	Session	Report Name: 2025_ALS_GCH11_CN2030A021_Q00W_20250509_P01 Report: L001 User Name: saengthai.2005@non.agilent.com Full Name of Signer: Saengthai Trank Reason for signature: Cancelled printed and published this original version of document
May 9, 2025 11:06:23 AM	Auto	Reporting	Session	Report Generated: Certificate

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Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GCH11\_CN2030A021\_Q0

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User Name: saengthai.2005  
Report Generated by Hostname: LAPTOP-G358K0M7  
Print Date: May 9, 2025 11:32:14 AM

System No.: 2025\_ALS\_GCH11\_CN2030A021\_Q00W

2025\_ALS\_GCH11\_CN2030A021\_Q00W Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 11:31:17 AM	Auto	Reporting	Session	Report Generated: Report

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Date: May 9, 2025 11:32:14 AM  
System ID: 2025\_ALS\_GCH11\_CN2030A021\_Q0

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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.: 25CH709/1  
Page: 1 of 3

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

Equipment: pH Meter  
Manufacturer: Mettler Toledo  
Model: SevenExcellence  
Serial No.: B834291445  
ID No.: RYQ\_EN0152  
Condition As-Received:  
Received Date: 12 June 2025  
Calibration Date: 18 June 2025  
Reference: 2506-0407DSC-2  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
Rayong Branch  
616/70 Moo 5, T.Meenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

REVIEW BY: Photchanas  
APPROVED BY: Dhanu  
NEXT CAL DATE: 18/12/26

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-CH5 by comparison with temperature standard

Calibrated by: Walalak Sirithan  
Signature

Approved by: Approved Signatory

( ) Chakrit Waewwanjua  
( ) Porpan Palpin  
(x) Salthip Meangmal

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

Instrument Serial No. ID No. Cert. No. Due Date  
1) Document Process Calibrator 5403049 130RC116 24E2759 25 Aug 2025  
2) Ref. Standard Thermometer 486054 110R024 24757 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 Lange GmbH Ltd., Deutsche Akkreditierungsstelle, Accredited No. DA-AM-15184-01-00  
The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. ARI-1835

Buffer Solution Manufacturer Lot No. Exp. date  
pH 4.007 CPA chem 1066665 18 Jan 2027  
pH 7.000 Hach Lange GmbH C03322 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	Coverage factor
	pH	mV	mV	pH	(mV)	k
pH Meter	4.000	177.48	177.3	4.000	0.058	2.00
S/N: B834291445	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Cert.No.: 25CH709/1  
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	Uncertainty of pH Measurement	Coverage factor
			(mV)	(pH)	k
pH Electrode	4.007	4.008	181.1	0.0044	2.00
SN: S211504	7.000	7.000	4.9	0.0084	2.00
	10.010	10.007	-170.6	0.0086	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	Standard Temperature (°C)	UUC* Reading (mV)	Error (°C)	Uncertainty of measurement (°C)	Coverage factor
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 %.

-00-



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

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.: RYQ\_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) %  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch  
616/70 Moo 5, T.Meenam Khu, A.Pluakdaeng, Rayong 21140, Thailand

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

### Condition of this result of calibration

1. Reference standards Instruments:  
Instrument Model Serial No. Certificate No. Due Date  
1) Multi-Product Calibrator 5500A 6316111 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: Wichanawan Pothong  
Issue Date: 01 July 2025

Approved Signatory: Phatinee Preobpal  
Nantawat Khanchai  
Pongasom Boonyporn

Cert. No.: 25E1979/1  
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### Result of calibration: (\*) Without adjustment ( ) After adjustment

Function: DC voltage measurement

Standard Value	UUC* Reading	Error	Uncertainty
(mV)	(mV)	(mV)	(mV)
-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.

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