

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



right solutions.
right partner.

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

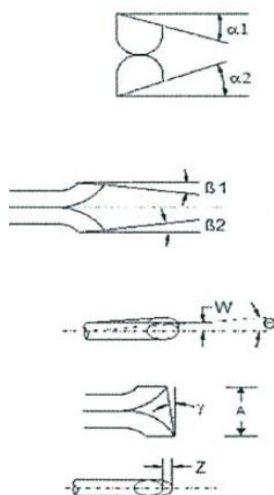
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Oxides of Nitrogen	Pitot Tube	RYG_FS0320	6-Jan-26	6-Jul-26	6
Stack	Oxides of Nitrogen	Fuel Gas Analyzer	RYG_FS0564	8-May-26	7-May-27	12
Stack	Oxides of Nitrogen	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Stack	Oxides of Nitrogen	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Stack	Oxides of Nitrogen	Air Sampling Pump	RYG_FS0507	3-Apr-26	3-Jul-26	3
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_FS0479	8-Jan-26	7-Jul-27	18
Stack	Oxides of Nitrogen	SPECTROPHOTOMETER	RYG_EN0179	18-Mar-25	18-Sep-26	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0213	9-Jan-26	8-Jan-27	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0617	21-Jan-26	20-Jan-27	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0438	29-Oct-25	28-Oct-26	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_FS0213	9-Jan-26	8-Jan-27	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0029	18-Aug-25	18-Aug-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0030	21-Jan-26	20-Jan-27	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0031	18-Aug-25	17-Aug-26	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0301	21-Jan-26	20-Jan-27	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0440	10-Mar-26	9-Mar-27	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0444	9-Mar-26	8-Mar-27	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0446	9-Mar-26	8-Mar-27	12
Noise	Noise Dose, TWA	Dosemeter	RYG_FS0448	9-Mar-26	8-Mar-27	12
Rayong Lab	Temperature	pH meter	RYG_FS0607	26-Nov-25	26-Nov-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	18-Mar-26	18-Sep-27	18
Rayong Lab	BOD	Burette	RYG_EN0216	18-Sep-25	18-Sep-26	12
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0163	3-Feb-26	3-Feb-27	12
Rayong Lab	Total Suspended Solids	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0163	3-Feb-26	3-Feb-27	12
Rayong Lab	Total Dissolved Solids 180°C	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0003	3-Feb-26	3-Feb-27	12
Rayong Lab	Oil & Grease	Liquid Bath (Water)	RYG_EN0220	27-Nov-25	27-Nov-26	12



Type S Pitot Tube Calibration

Date Calibration 6-Jan-26
Pitot ID RYG_FS0320
Pitot SN

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



Parameter	Value	Allowable Range	Check
$\alpha 1$	0.6	$-10^{\circ} < \alpha 1 < +10^{\circ}$	OK
$\alpha 2$	1.3	$-10^{\circ} < \alpha 2 < +10^{\circ}$	OK
$\beta 1$	0.4	$-5^{\circ} < \beta 1 < +5^{\circ}$	OK
$\beta 2$	0.8	$-5^{\circ} < \beta 2 < +5^{\circ}$	OK
γ	0.9	-	-
θ	1.1	-	-
$Z = A \tan \gamma$	0.013	$Z \leq 0.125''$	OK
$W = A \tan \theta$	0.016	$W \leq 0.031''$	OK
Dt	0.300	0.188" to 0.375"	OK
$A/2Dt$	1.372	$1.05 \leq PA/Dt \leq 1.5$	OK
A	0.823	$2.1Dt \leq A \leq 3Dt$	OK

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

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

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

Certificate No: G 260304

Date of issue : 08-May-26

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350
Instrument serial no. : 62985049/1121
Control unit serial no. : 03580182/1121
ID no. or control no. : RYG_FS0564
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 2 Pages
Receiving no. : L-261141
Receiving date. : 23-Apr-26
Parameter of calibration : Gas Calibration(Oxygen, Carbon Monoxide, Nitrogen Dioxide, Nitric Oxide, Sulphur Dioxide)
Condition of UUC. : Used
Ambient condition : All of the Measurment were caried out the stabilized labotary
 Temperature : 23 $\pm$ 5 $^{\circ}$ C
 Humidity : 55 $\pm$ 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

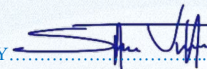
The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent Multiplied by coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

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

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

Date of calibration : 08-May-26

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


 Mr. Kwanchai Khamdoun
Calibration Technician


 Mrs. Nongluck Wongsettee
Technical Manager

Certificate No.: G 260304

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.506 % Vol	1287/25	Linde	08-May-29
Oxygen (O ₂) 9.984 % Vol	CG-0090-25	Nimt	24-Jun-30
Oxygen (O ₂) 21.01 % Vol	CG-0112-24	Nimt	01-Aug-29
Carbon monoxide (CO) 80.47 ppm	3276/25	Linde	09-Nov-27
Carbon monoxide (CO) 300.9 ppm	1422/25	Linde	21-May-29
Carbon monoxide (CO) 1000 ppm	3131/25	Linde	27-Oct-29
Nitrogen Dioxide (NO ₂) 30.68 ppm	2832/24	Linde	08-Sep-26
Nitrogen Dioxide (NO ₂) 81.32 ppm	3246/25	Linde	09-Nov-27
Nitrogen Dioxide (NO ₂) 202.4 ppm	0029/26	Linde	04-Jan-28
Nitric Oxide (NO) 29.8 ppm	CG-0145-25	Nimt	27-Oct-27
Nitric Oxide (NO) 151.8 ppm	0404/25	Linde	09-Feb-27
Nitric Oxide (NO) 322 ppm	1234/25	Linde	04-May-27
Sulphur Dioxide (SO ₂) 50.4 ppm	1306/25	Linde	12-May-27
Sulphur Dioxide (SO ₂) 100.7 ppm	2662/24	Linde	25-Aug-26
Sulphur Dioxide (SO ₂) 605.9 ppm	1229/25	Linde	04-May-27

Measured room conditions

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

Calibration conditions

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

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.506	2.44	-0.066	0.15
O ₂ (%Vol)	9.984	9.93	-0.054	0.20
O ₂ (%Vol)	21.01	21.14	0.13	0.30
CO (ppm)	80.47	81	0.53	3.0
CO (ppm)	300.9	304	3.1	6.0
CO (ppm)	1000	1006	6	12
NO ₂ (ppm)	30.68	28.7	-1.98	8.0
NO ₂ (ppm)	81.32	79.2	-2.12	8.0
NO ₂ (ppm)	202.4	199.6	-2.8	12
NO (ppm)	29.8	32	2.2	8.0
NO (ppm)	151.8	155	3.2	8.0
NO (ppm)	322	327	5	12
SO ₂ (ppm)	50.4	49	-1.4	6.0
SO ₂ (ppm)	100.7	101	0.3	6.0
SO ₂ (ppm)	605.9	608	2.1	13

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

End of Certificate of Calibration



Certificate of Calibration

Customer

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

Certificate No : 25-AFM-208

Request No : Req-2025-1986

Unit Under Calibration Details

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

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

Calibration Environment and Details

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

REVIEW BY	<i>Narakan P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL DATE	09/09/26

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	6 May 2026
Temperature meter	GT 11	08000057	Qreborn	15 October 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

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

Note :

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

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

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

Issue Date : 10 September 2025



Certificate No : 25-AFM-208

Request No : Req-2025-1986

Result of Calibration : Without Adjustment

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

Note

STD : Standard UUC : Unit Under Calibration

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

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

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

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

meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate



Certificate of Calibration

Customer

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

Certificate No : 25-AFM-207

Request No : Req-2025-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mesa Labs
Model : 200-510L
Serial Number : 130026
ID : BKK_FS0619
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : -

Sensor Serial Number : -

Instrument Status : Used

Calibration Environment and Details

Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$
Humidity : $55\% \text{RH} \pm 20\% \text{RH}$
Barometric Pressure : $1013 \text{ hPa} \pm 10 \text{ hPa}$
Received Date : 3 September 2025
Calibration Date : 10 September 2025
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

REVIEW BY *Marakorn P.*

APPROVED BY *[Signature]*

NEXT CAL DATE.....09/09/26.....

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	6 May 2026
Temperature meter	GT 11	08000057	Qreborn	15 October 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

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

Note :

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

Calibration By :

[Signature]
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

[Signature]
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 10 September 2025

Certificate No : 25-AFM-207

Request No : Req-2025-1987

Result of Calibration : Without Adjustment

STD Reading			UUC Readingg			Error (cc/min)	Uncertainty		
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)		(cc/min)	(°C)	(kPa)
25.5	100.98	20	-	-	20.042	0.0	1.6	1.0	0.50
25.5	100.90	50	-	-	49.921	-0.1	4.0	1.0	0.50
25.5	100.91	100	-	-	100.09	0.1	3.6	1.0	0.50
25.4	100.86	150	-	-	150.34	0.3	5.4	1.0	0.50
25.6	100.93	199	-	-	200.17	1.2	7.2	1.0	0.50
25.6	100.95	301	-	-	300.05	-1	11	1.0	0.50
25.7	100.96	402	-	-	401.03	-1	14	1.0	0.50
25.7	100.95	503	-	-	500.26	-3	10	1.0	0.50

Note

STD : Standard UUC : Unit Under Calibration

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

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

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

* Indicates non accredited

End of Certificate



Certificate of Calibration

Certificate No. C-030426-RYG_FS0507

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir PlusEquipment ID : RYG_FS0507
Serial No. : 20201110089
Calibration Date : 03-Apr-26
Next calibration date : 03-Jul-26

Reference Standard Low Flow Meter

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

Reference Standard High Flow Meter

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

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.9	20.2	20.3	20.5	5%	19 - 21	Passed
50	50.3	50.5	51.4	50.7	5%	48 - 53	Passed
100	99.7	100.3	101.6	100.5	5%	95 - 105	Passed
200	200.8	199.7	199.4	200.0	5%	190 - 210	Passed
High Flow							
500	504.5	506.2	504.4	505.0	3%	485 - 515	Passed
1000	999.5	998.9	1000.8	999.7	3%	970 - 1030	Passed
2000	2005.3	2004.1	2003.0	2004.1	3%	1940 - 2060	Passed
2500	2501.3	2502.2	2500.1	2501.2	3%	2425 - 2575	Passed

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

Calibrated By: นันทพงศ์

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 04-Apr-26

Approved By: Supot S

(Mr. Supot Salamteh)

Field Services Section Head

CERTIFICATE OF CALIBRATION

FOR

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

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

DATE OF RECEIVED : 07 January 2026

DATE OF ISSUED : 09 January 2026

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

Calibrated By : Sittipong Pimdee
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
09 January 2026



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

Certificate No. Q26001113

F3-011-05/12-23

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@clccalibration

REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPPP-05** according to **DKD-R 6-1** as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

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

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).

Certificate No. MP-0211-25, Due Date 19 August 2026.

UNCERTAINTY :

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

Certificate No. Q26001113

F3-011-05/12-23

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@clccalibration

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

CORRECTION OF PRESSURE

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

Uncertainty of measurement ± 0.036 inHg

Technical Note. Transmitting fluid : Air.

Conversion factor 1 kPa ; 0.2953003 inHg

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

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

End of Certificate

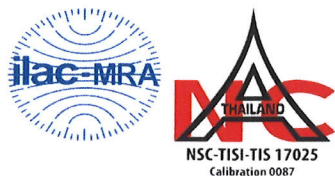
Certificate No. Q26001113

F3-011-05/12-23

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@clccalibration



Certificate of Calibration

Equipment:	SPECTROPHOTOMETER	Certificate No.:	C06250109
Model:	DR3900	Issued Date:	18 March 2025
Serial No. (or ID.):	2021761 (RYG_EN0179)	Job No.:	WO-00064379
Manufacturer:	HACH	Page:	1 of 3
Condition:	In Condition		

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

Environment Condition:

Temperature	24.3	°C	±	0.3	°C
Humidity	60.0	%RH	±	4.4	%RH



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

Calibration By: Mr.Preecha Phooarsai

Calibration Date: 18 March 2025

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

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

The standard for Wavelength Certificate No. 111583 and 111584

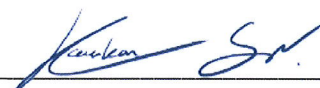
The standard for Photometric Certificate No. 9114984

The standard for Stray light Certificate No. 111585



(Mr. Preecha Phooarsai)

Person in charge



(Miss Kaewkan Suradech)

Authorized signatory

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

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

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

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

DKSH Technology Limited

2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260

2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

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

Calibration Results:

Without Adjustment

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

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.40	418	0.40	0.59
537.00	536	1.00	0.59
638.00	638	0.00	0.59
747.61	748	-0.39	0.59
807.04	807	0.04	0.59

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2930	0.289	0.0040	0.0045
	0.5168	0.515	0.0018	0.0045
	1.0298	1.028	0.0018	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2867	0.282	0.0047	0.0045
	0.5073	0.503	0.0043	0.0045
	1.0083	1.003	0.0053	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2516	0.248	0.0036	0.0045
	0.4595	0.460	-0.0005	0.0045
	0.9334	0.935	-0.0016	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2461	0.244	0.0021	0.0045
	0.4652	0.465	0.0002	0.0045
	0.9468	0.947	-0.0002	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2594	0.257	0.0024	0.0045
	0.5040	0.503	0.0010	0.0045
	1.0032	1.001	0.0022	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2579	0.256	0.0019	0.0045
	0.4971	0.496	0.0011	0.0045
	0.9720	0.971	0.0010	0.0045

Calibration Results:**Without Adjustment****Stray light ***

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
391.44 +/- 0.11 nm	391	3.8	1.420

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

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00064379

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR3900

หมายเลขเครื่อง: 2021761

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
18 Mar 2025			18 Mar 2025		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<i>General</i>			
☒	☐	1. ความสมบูรณ์เครื่อง	☒	☐	
☒	☐	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	☒	☐	
☒	☐	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Swicth)	☒	☐	
☒	☐	4. ปุ่มกด (Keypad)	☒	☐	
☒	☐	5. หน้าจอ (Display, Screen Contrast)	☒	☐	
		<i>Spectrophotometer</i>			
☐	☐	6. แรงดันไฟฟ้า (Battery Backup) ≥ 2.5 VDC	☐	☐	
☐	☐	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	☐	☐	
☒	☐	8. ความยาวคลื่น (Wavelength Check)	☒	☐	807nm=807.3nm
☐	☐	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	☐	☐	
☒	☐	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	☒	☐	
☐	☐	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	☐	☐	
		<i>pH Meter and Conductivity Meter</i>			
☐	☐	12. อิเล็กโทรด (Electrode and Connection Cable)	☐	☐	
☐	☐	13. ระดับสารละลายใน Electrode (Level KCl)	☐	☐	
☐	☐	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	☐	☐	
☐	☐	15. ขาจับอิเล็กโทรด (Stand)	☐	☐	
		<i>Turbidimeter</i>			
☐	☐	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	☐	☐	
☐	☐	17. ระดับการส่องสว่างของแสง (≥ 2.5 ไม่เกิน 3.0)	☐	☐	
		<i>Automatic titrator</i>			
☐	☐	18. สภาพ Piston Burettes	☐	☐	
☐	☐	19. Function Rinsing and Dosing	☐	☐	
☐	☐	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	☐	☐	

เพิ่มเติม/ข้อแนะนำ :

Mr.Preecha Phooarsai

Service Engineer

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd. **Certificate No** : 26-ACT-007
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, **Request No** : Rcq-2026-0043
Bangkok 10250

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : RION Range : 94 dB / 1000 Hz
Model : NC-74 Instrument Status : Used
Serial Number : 34178121
ID : RYG_FS0213

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 7 January 2026
Calibration Date : 9 January 2026
Location of Calibration : LAB 1 Acoustic

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

REVIEW BY 
APPROVED BY 
NEXT CAL DATE... 08/ 01/ 2027

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

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

Note

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

Calibrated By :



Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :



Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 9 January 2026

Certificate No : 26-ACT-007

Request No : Req-2026-0043

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)
	Measured	Deviated value	Measured	Deviated value	
94 dB / 1000 Hz	94.08	0.08	-	-	0.12

Frequency of Sound pressure level

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

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

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

Note :

- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

Cert. No. : ACL26083

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00623392 / 198639/ 26420
ID No.: RYG_FS0617

Condition As Found : GOOD

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

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

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

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

Calibrated by :

Nathakorn Pisutpaisan

Approved by :


(Nitinun Srihawan)

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Cert. No. : ACL26083
Job No. : VC69AC0053
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL26083
Job No. : VC69AC0053
Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL26083

Job No. : VC69AC0053

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Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.8

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	19.0
Flat	24.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	1.1	1.2	1.2	±5.0

Cert. No. : ACL26083

Job No. : VC69AC0053

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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

07/10/2015

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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	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

M. T. K. S.

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8. Level linearity including the level range control

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

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	107.9	-0.1	1.0 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

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10. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

Signature

Cert. No. : ACL25413

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00597168 / 180411 / 88181
ID No.: RYG_FS0438

Condition As Found : GOOD

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

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

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

REVIEW BY	
APPROVED BY	
NEXT CAL DATE	28/ 10/ 2026

Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(Nitinun Srihawan)

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Cert. No. : ACL25413
Job No. : VC69AC0014
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).
- 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25413

Job No. : VC69AC0014

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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
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. : ACL25413

Job No. : VC69AC0014

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Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Weighting (dB)
A - weight	11.6
C - weight	18.0
Flat	23.5

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	0.0	0.0	0.0	± 1.0
8000	1.3	1.4	1.4	±5.0

Cert. No. : ACL25413

Job No. : VC69AC0014

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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

MSB-05

Cert. No. : ACL25413

Job No. : VC69AC0014

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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.1	0.1	± 1.1
84.0	84.1	0.1	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.1	0.1	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.1	0.1	± 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	26.2	0.2	± 1.1
25.0	25.1	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	28.9	-0.1	±1.1

9. Tone burst response

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

Cert. No. : ACL25413
Job No. : VC69AC0014
Pages : 8 of 8

10. Peak C sound level

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

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

Cert. No. : ACL25314

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Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734223 / 169439 / 72460
ID No.: RYG_FS0029

Condition As Found : GOOD

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

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

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

REVIEW BY *Supt S*

APPROVED BY *[Signature]*

NEXT CAL DATE.....18/ 08/ 2026.....

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

Wichok B
(Wichok Ekpongpradit)

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

Cert. No. : ACL25314

Job No. : VC68AC0162

Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

3.3 Electrical And Electronics Institute (EEI).

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

Summary of Measurement Result :

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

Cert. No. : ACL25314

Job No. : VC68AC0162

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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)
13.50000003

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

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

3. Acoustical signal tests of frequency weightings

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

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

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Job No. : VC68AC0162
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Cert. No. : ACL25314

Job No. : VC68AC0162

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7. Level linearity on the reference level range

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

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

8. Level linearity including the level range control

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

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

9. Tone burst response

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

Cert. No. : ACL25314

Job No. : VC68AC0162

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10. Peak C sound level

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

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

Cert. No. : ACL26079

Pages : 1 of 8

Calibration Certificate

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

Condition As Found : GOOD

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

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

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

REVIEW BY 

APPROVED BY 

NEXT CAL DATE 20/ 01/ 2027

Calibrated by :

Nathakorn Pisutpaisan

Approved by :


(Nitinun Srihawan)

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

Cert. No. : ACL26079

Job No. : VC69AC0053

Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL26079

Job No. : VC69AC0053

Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL26079

Job No. : VC69AC0053

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Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Weighting (dB)
A - weight	11.9
C - weight	18.1
Flat	23.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.2	1.9	1.9	±5.0

Cert. No. : ACL26079

Job No. : VC69AC0053

Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

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Cert. No. : ACL26079

Job No. : VC69AC0053

Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

Cert. No. : ACL26079
Job No. : VC69AC0053
Pages : 7 of 8

8. Level linearity including the level range control

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

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

9. Tone burst response

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

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

10. Peak C sound level

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

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

Cert. No. : ACL25315

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00734218 / 146937 / 34368
ID No.: RYG_FS0031

Condition As Found : GOOD

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

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

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

REVIEW BY *Supt S*

APPROVED BY *[Signature]*

NEXT CAL DATE 17/ 08/ 2026

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

Wichou B
(Wichok Ekpongpradit)

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

Cert. No. : ACL25315

Job No. : VC68AC0162

Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

3.3 Electrical And Electronics Institute (EEI).

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

Summary of Measurement Result :

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

Cert. No. : ACL25315

Job No. : VC68AC0162

Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
21.6

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

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

3. Acoustical signal tests of frequency weightings

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

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

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

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Cert. No. : ACL25315

Job No. : VC68AC0162

Pages : 6 of 8

7. Level linearity on the reference level range

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

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

8. Level linearity including the level range control

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

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

9. Tone burst response

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

Cert. No. : ACL25315

Job No. : VC68AC0162

Pages : 8 of 8

10. Peak C sound level

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

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

Cert. No. : ACL26080

Pages : 1 of 8

Calibration Certificate

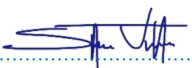
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472126 / 66239 / 88180
ID No.: RYG_FS0301

Condition As Found : GOOD

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

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

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

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

Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(Nitinun Srihawan)

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Cert. No. : ACL26080
Job No. : VC69AC0053
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

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

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL26080
Job No. : VC69AC0053
Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL26080

Job No. : VC69AC0053

Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
23.6

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

Frequency Weighting	Weighting (dB)
A - weight	10.8
C - weight	16.8
Flat	22.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.1	0.2	± 1.5
1000	0.1	0.1	0.2	± 1.0
8000	0.8	0.9	0.9	±5.0

Cert. No. : ACL26080

Job No. : VC69AC0053

Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Cert. No. : ACL26080

Job No. : VC69AC0053

Pages : 6 of 8

7. Level linearity on the reference level range

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

Cert. No. : ACL26080

Job No. : VC69AC0053

Pages : 7 of 8

8. Level linearity including the level range control

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

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

9. Tone burst response

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

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

10. Peak C sound level

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

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

Signature

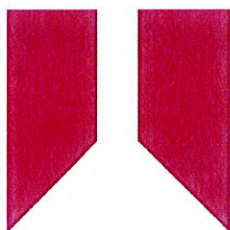
CERTIFICATE OF CALIBRATION

RYG_FS0440

ISSUED BY Cirrus Research plc

DATE OF ISSUE 10 March 2026

CERTIFICATE NUMBER 261146



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

Page 1 of 2

Approved signatory

N.Smith

Electronically signed:

doseBadge Reader : IEC 60942:2003

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: RC:110A

Serial number: 89107

Class: 2

Test summary

Date of calibration: 10 March 2026

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

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

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

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

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

Notes:

REVIEW BY

APPROVED BY

NEXT CAL DATE

09/ 03/ 2027

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CERTIFICATE OF CALIBRATION

Certificate Number:

261146

Page 2 of 2

Environmental conditions

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

Before Pressure: 100.27 kPa Temperature: 23.0 °C Humidity: 44.3 %
After Pressure: 100.27 kPa Temperature: 23.0 °C Humidity: 38.4 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Distortion Meter	Keithley	2015	0939404
Environmental Monitor	Comet	T7510	21962628

Initial Acoustic Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	106.90	107.12	107.16	107.06	-6.94	±0.75	0.11 dB
Distortion (%)	< 4.00	3.44	3.10	4.62	3.72	3.72	+4.00	0.13 %
Frequency (Hz)	1000.0	1002.3	1002.3	1002.3	1002.3	2.3	±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

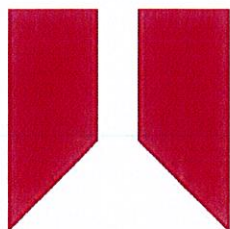
	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Tolerance	Uncertainty
Level (dB)	114.00	113.97	113.97	114.02	113.99	-0.01	±0.75	0.11 dB
Distortion (%)	< 4.00	0.17	0.16	0.17	0.17	0.17	+4.00	0.13 %
Frequency (Hz)	1000.0	1002.3	1002.2	1002.3	1002.3	2.3	±20.0	0.1 Hz

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 **10 March 2026**CERTIFICATE NUMBER **261113**

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

Page 1 of 6

Approved signatory

N.Smith

Electronically signed:

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: **Cirrus Research plc**

Notes:

Model: **CR:110AIS**Serial number: **YG571**Firmware version: **5.2**

Test summary

Date of calibration: **09 March 2026**

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	SDG1XDDC7R0315
Attenuator	Cirrus Research	ZE:952	101223
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	109288

Notes

REVIEW BY

APPROVED BY

NEXT CAL DATE **08/ 03/ 2027**

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CERTIFICATE OF CALIBRATION

Certificate Number:

261113

Page 2 of 6

Environmental conditions

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

Before	Pressure: 101.01 kPa	Temperature: 22.6 °C	Humidity: 43.6 %
After	Pressure: 100.98 kPa	Temperature: 22.6 °C	Humidity: 43.9 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity 1995	Complies
Linearity 1995	Complies
Short Duration 1995	Complies
Overload Latching 1995	Complies
Frequency weighting 1995	Complies

CERTIFICATE OF CALIBRATION

Certificate Number:

261113

Page 3 of 6

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:

261113

Page 4 of 6

B1: Absolute Acoustical Sensitivity

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	114.40	-0.4	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Response To Steady Signals

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Range: 80 – 130 dB

Input Level (dB)	Expected Exposure (Pa ² h)	Exposure (Pa ² h)	Duration (s)	Deviation (Pa ² h)	Limits (Pa ² h)	Deviation (%)	Limits (%)
80	0.000222	0.000267	20	-0.000045	0.000175 / 0.000280	20	-21 / +26
90	0.002222	0.002172	20	0.000050	0.001755 / 0.002800	-2	-21 / +26
100	0.022222	0.022222	20	-0.000000	0.017555 / 0.028000	-0	-21 / +26
110	0.222222	0.227398	20	-0.005176	0.175555 / 0.280000	2	-21 / +26
120	2.222222	2.381154	20	-0.158932	1.755555 / 2.800000	7	-21 / +26
130	22.222223	24.366183	20	-2.143960	17.555556 / 28.000001	10	-21 / +26

CERTIFICATE OF CALIBRATION

Certificate Number:

261113

Page 5 of 6

B3: Frequency Weightings

Result: **Passed**

Reference Frequency: 1000 Hz

Reference Exposure: 5.6984599601109

Reference Input Level: 127 dB

Duration: 10 Seconds

Frequency (Hz)	Exposure (Pa ² h)	Exposure Ratio	Ratio Limit	Uncertainty
125	0.130544	0.0229	0.0174 / 0.0347	0.15
8000	2.321440	0.4074	0.246 / 2.455	0.15

B4: Short-Duration Signals

Result: **Passed**

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 ² h)	Exposure (Pa ² h)	Deviation (%)	Limits (%)
114	95	1:100	10	10	990	0.003514	0.003279	-7	-21 / +26
129	100	1:1000	10	1	999	0.011111	0.010369	-7	-29 / +41

CERTIFICATE OF CALIBRATION

Certificate Number:

261113

Page 6 of 6

B6: Latching Overload Indicator

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

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

End of results

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 10 March 2026

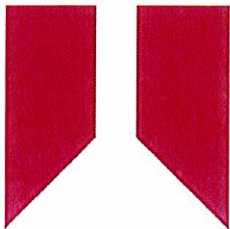
CERTIFICATE NUMBER 261114

Page 1 of 6

Approved signatory

N.Smith

Electronically signed:



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

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: CR:110AIS

Serial number: YG573

Firmware version: 5.4

Test summary

Date of calibration: 09 March 2026

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	SDG1XDDD7R6629
Attenuator	Cirrus Research	ZE:952	96919
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

Notes

REVIEW BY



APPROVED BY



NEXT CAL DATE 08/ 03/ 2027

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CERTIFICATE OF CALIBRATION

Certificate Number:

261114

Page 2 of 6

Environmental conditions

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

Before	Pressure: 101.10 kPa	Temperature: 22.7 °C	Humidity: 42.3 %
After	Pressure: 101.07 kPa	Temperature: 22.7 °C	Humidity: 42.4 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity 1995	Complies
Linearity 1995	Complies
Short Duration 1995	Complies
Overload Latching 1995	Complies
Frequency weighting 1995	Complies

CERTIFICATE OF CALIBRATION

Certificate Number:

261114

Page 3 of 6

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:

261114

Page 4 of 6

B1: Absolute Acoustical Sensitivity

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	115.20	-1.2	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Response To Steady Signals

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Range: 80 – 130 dB

Input Level (dB)	Expected Exposure (Pa ² h)	Exposure (Pa ² h)	Duration (s)	Deviation (Pa ² h)	Limits (Pa ² h)	Deviation (%)	Limits (%)
80	0.000222	0.000273	20	-0.000051	0.000175 / 0.000280	23	-21 / +26
90	0.002222	0.002327	20	-0.000105	0.001755 / 0.002800	5	-21 / +26
100	0.022222	0.022740	20	-0.000518	0.017555 / 0.028000	2	-21 / +26
110	0.222222	0.227398	20	-0.005176	0.175555 / 0.280000	2	-21 / +26
120	2.222222	2.326952	20	-0.104730	1.755555 / 2.800000	5	-21 / +26
130	22.222223	23.811541	20	-1.589318	17.555556 / 28.000001	7	-21 / +26

CERTIFICATE OF CALIBRATION

Certificate Number:

261114

Page 5 of 6

B3: Frequency Weightings

Result: **Passed**

Reference Frequency: 1000 Hz

Reference Exposure: 5.5687471751468

Reference Input Level: 127 dB

Duration: 10 Seconds

Frequency (Hz)	Exposure (Pa ² h)	Exposure Ratio	Ratio Limit	Uncertainty
125	0.130544	0.0234	0.0174 / 0.0347	0.15
8000	2.375513	0.4266	0.246 / 2.455	0.15

B4: Short-Duration Signals

Result: **Passed**

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 ² h)	Exposure (Pa ² h)	Deviation (%)	Limits (%)
114	95	1:100	10	10	990	0.003595	0.003132	-13	-21 / +26
129	100	1:1000	10	1	999	0.011370	0.010369	-9	-29 / +41

CERTIFICATE OF CALIBRATION

Certificate Number:

261114

Page 6 of 6

B6: Latching Overload Indicator

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

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

End of results

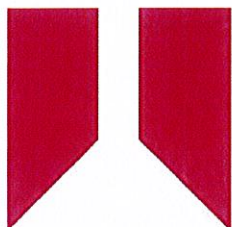
CERTIFICATE OF CALIBRATION

RYG_FS0448

ISSUED BY Cirrus Research plc

DATE OF ISSUE 10 March 2026

CERTIFICATE NUMBER 261110



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

Page 1 of 6

Approved signatory

N.Smith

Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: CR:110AIS

Serial number: YG575

Firmware version: 5.2

Test summary

Date of calibration: 09 March 2026

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	SDG1XDDC7R0315
Attenuator	Cirrus Research	ZE:952	101223
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	109288

Notes

REVIEW BY

APPROVED BY

NEXT CAL DATE 08/ 03/ 2027

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CERTIFICATE OF CALIBRATION

Certificate Number:

261110

Page 2 of 6

Environmental conditions

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

Before	Pressure: 100.92 kPa	Temperature: 22.9 °C	Humidity: 44.7 %
After	Pressure: 100.89 kPa	Temperature: 22.9 °C	Humidity: 44.8 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity 1995	Complies
Linearity 1995	Complies
Short Duration 1995	Complies
Overload Latching 1995	Complies
Frequency weighting 1995	Complies

CERTIFICATE OF CALIBRATION

Certificate Number:

261110

Page 3 of 6

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:

261110

Page 4 of 6

B1: Absolute Acoustical Sensitivity

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	113.50	0.5	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Response To Steady Signals

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Range: 80 – 130 dB

Input Level (dB)	Expected Exposure (Pa ² h)	Exposure (Pa ² h)	Duration (s)	Deviation (Pa ² h)	Limits (Pa ² h)	Deviation (%)	Limits (%)
80	0.000222	0.000280	20	-0.000058	0.000175 / 0.000280	26	-21 / +26
90	0.002222	0.002172	20	0.000050	0.001755 / 0.002800	-2	-21 / +26
100	0.022222	0.022222	20	-0.000000	0.017555 / 0.028000	-0	-21 / +26
110	0.222222	0.222222	20	-0.000000	0.175555 / 0.280000	0	-21 / +26
120	2.222222	2.326952	20	-0.104730	1.755555 / 2.800000	5	-21 / +26
130	22.222223	23.269524	20	-1.047301	17.555556 / 28.000001	5	-21 / +26

CERTIFICATE OF CALIBRATION

Certificate Number:

261110

Page 5 of 6

Result: **Passed**

B3: Frequency Weightings

Reference Frequency: 1000 Hz

Reference Exposure: 5.5687471751468

Reference Input Level: 127 dB

Duration: 10 Seconds

Frequency (Hz)	Exposure (Pa ² h)	Exposure Ratio	Ratio Limit	Uncertainty
125	0.130544	0.0234	0.0174 / 0.0347	0.15
8000	2.321440	0.4169	0.246 / 2.455	0.15

B4: Short-Duration Signals

Result: **Passed**

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 ² h)	Exposure (Pa ² h)	Deviation (%)	Limits (%)
114	95	1:100	10	10	990	0.003356	0.003204	-5	-21 / +26
129	100	1:1000	10	1	999	0.010611	0.009242	-13	-29 / +41

CERTIFICATE OF CALIBRATION

Certificate Number:

261110

Page 6 of 6

B6: Latching Overload Indicator

Result: **Passed**

Frequency: 1000 Hz

Uncertainty: 0.2 dB

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

End of results



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.: 25CH1370

Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C232588422
ID No. : RYG_FS0607
Condition As-Received: Used Item
Received Date : 25 November 2025
Calibration Date : 26 November 2025
Reference : 2511-0724DSC-3
Submitted by :

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirithean

Approved by :

Saithip

Approved Signatory

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

Issue Date : 28 November 2025

REVIEW BY	<i>Pitthaya T.</i>
APPROVED BY	<i>Saithip S.</i>
NEXT CAL DATE	26/11/26

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 25CH1370

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	25E2743	25 Aug 2026
2) Ref. Standard Thermometer	4982054	110RC044	25I708	03 July 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.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.007	CPA chem	1114384	12 June 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1135355	16 Aug 2026

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: C232588422	4.00	177.48	178	4.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.00	0.58	2.00



Cert.No.: 25CH1370

Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement ($\pm$)	Coverage factor k
pH Electrode S/N.: 5232481	4.007	4.01	180	0.0086	2.05
	6.965	6.97	5	0.011	2.00
	10.010	10.01	-171	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab Expert Go-ISM

- Serial No. : 5232481

Dimension of probe

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement ($\pm$ °C)	Coverage factor k
25.0	25.001	25.0	-0.001	0.13	2.00
45.0	45.001	45.0	-0.001	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

-o0o-



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.: 25CH847

Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenCompact S220
Serial No. : C104059460
ID No. : RYG_EN0183
Condition As-Received: Used Item
Received Date : 17 July 2025
Calibration Date : 18 July 2025
Reference : 2507-0561DSC-3
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5, T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand

Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirithean

Approved by :

Saithip

Approved Signatory

() Chakrit Waewwanjua

() Ponpan Paipim

(✓) Saithip Meangmai

Issue Date : 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 3 : Equipment Calibration and Testing Services.



Cert.No.: 25CH847

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	3240076	60RC033	25I394	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.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

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

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: C104059460	4.000	177.48	177.3	4.000	0.058	2.00
	7.000	0.00	-0.2	7.000	0.058	2.00
	10.000	-177.48	-177.6	10.000	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 (mV)	Uncertainty of pH Measurement ($\pm$)	Coverage factor k
pH Electrode S/N.: 5240606	4.007	4.008	184.6	0.0044	2.00
	6.965	6.966	10.2	0.0084	2.00
	10.010	10.009	-164.9	0.0065	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Pro-ISM

- Serial No. : 5240606

Dimension of probe

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement ($\pm$ $^{\circ}\text{C}$)	Coverage factor k
25.0	25.001	25.0	-0.001	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 25E2372

Page : 1 of 2

Equipment : pH Meter
Manufacturer: Mettler Toledo
Model : SevenCompact S220
Serial No.: C104059460
ID No.: RYG_EN0183

Condition As-Received: Used Item

Received Date: 17 July 2025

Calibration Date: 22 July 2025

Reference: 2507-0561DSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 10) %

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

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

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

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

Condition of this result of calibration

1.Reference standards instruments :

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

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

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

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

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

Calibrated by : Napachanok Prasomsoosiri
Issue Date : 23 July 2025

Approved Signatory :


[] Phalinee Prabpaipal
[] Nuntawat Khamchai
[✓] Pongsagorn Boonyaporn



Cert. No.: 25E2372

Page.: 2 of 2

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

Function: DC voltage measurement

Range:

2000

mV

<u>Standard Value</u>	<u>UUC* Reading</u>	<u>Error</u>	<u>Uncertainty</u>
(mV)	(mV)	(mV)	($\pm$ μ V)
-200.0000	-200.0	0.0	68
-150.0000	-150.0	0.0	65
-100.0000	-100.0	0.0	63
-50.0000	-50.0	0.0	61
0.0000	0.0	0.0	58
50.0000	49.9	-0.1	61
100.0000	99.9	-0.1	63
150.0000	149.9	-0.1	65
200.0000	199.9	-0.1	68

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

UUC* = Unit Under Calibration.

-o0o-



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Certificate of Calibration

Cert. No.: 25LM10

Page.: 1 of 2

Equipment : DO Meter with Sensor

Manufacturer : YSI

Model : 5000-115V

Serial No. : 15E102796

ID No. : RYG_EN0032

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

Location : TPA On Site Calibration Laboratory

Received Order : 17 January 2025

Calibrated Date : 20 January 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lerngagtrakul

Approved by :

Approved Signatory

() Chakrit Waewwanjua

(✓) Suwit Imjai

() Kunchit Promprat

Issue Date : 23 January 2025

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

REVIEW BY Photchana S.

APPROVED BY

NEXT CAL DATE 20/07/26



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

Cert. No.: 25LM10
Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Digital Thermometer	2188080	2411022	TPA	17 Sep 2025
2. This certificate is valid only to the item calibrated on date and place of calibration.				
3. This certification is traceable to the International System of Unit.				

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 15E100464

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
20.00	60	20.002	19.81	-0.192	0.15	2.00

UUC* : Unit Under Calibration

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

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

Certificate of Testing

Cert.No.: 25TW15

Page.: 1 of 2

Equipment :	DO Meter
Manufacturer :	YSI
Model :	5000-115V
Serial No. :	15E102796
ID No. :	RYG_EN0032
Received Date :	17 January 2025
Test Date :	20 January 2025
Reference :	2501-0600DSC-1
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch) 616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand
Laboratory Condition :	Temperature (25 ± 5) °C Humidity (50 ± 20) %
Test Procedure :	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
Tested by :	Walalak Sirithean
Approved by :	 _____ Approved Signatory
() Pornthippa Tameyakul () Ponpan Paipim (✓) Saithip Meangmai	
Issue Date :	21 January 2025



Cert.No.: 25TW15

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

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

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 15E100464

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.20	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory.

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Certificate of Calibration

Cert. No.: 24TM1663

Page : 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG_EN0154

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

Location : BOD Room

Received Order : 01 November 2024

Calibration Date : 01 November 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Krisda Malee

Approved by :

Kunchit

Approved Signatory

() Ponpan Paipim

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date :

07 November 2024

REVIEW BY *Thanitak*

APPROVED BY *D. J. J. J.*

NEXT CAL DATE..... 01/05/26

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



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:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY44073381	24LM73	TPA	18 May 2025

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

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

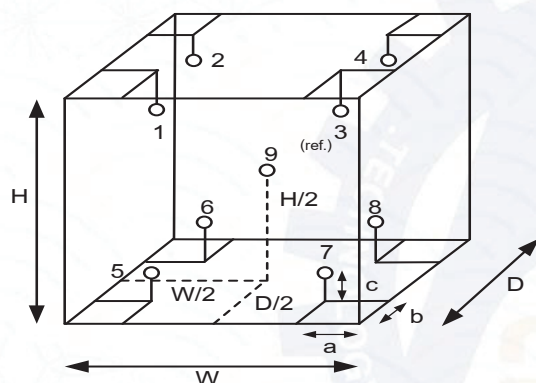
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	55	53
AC Supply (Volt)	220	221



Position :	Ref. Std. ID No.:
1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	23-01RTD-07
8	1RTD-2/8
9 (ref.)	23-01RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.72 m³



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 <i>k</i>
20.0	20.0	20.0	0.026	0.26	0.53	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	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 %.

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Certificate of Calibration

Cert. No.: 26TM461

Page : 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG_EN0154

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

Location : BOD Room

Received Order : 18 March 2026

Calibration Date : 18 March 2026

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Preecha Hlahib

Approved by :

Kunchit

Approved Signatory

() Chakrit Waewwanjua

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 31 March 2026

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

REVIEW BY *Thanita K.*

APPROVED BY *D. Khunon*

NEXT CAL DATE *18/09/27*



Equipment : Low Temp. Incubator
Condition As-Received : New Item
Reference : 2603-0502OC-2

Cert. No.: 26TM461

Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY49023932	25LM121	TPA,	27 Jul 2026

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

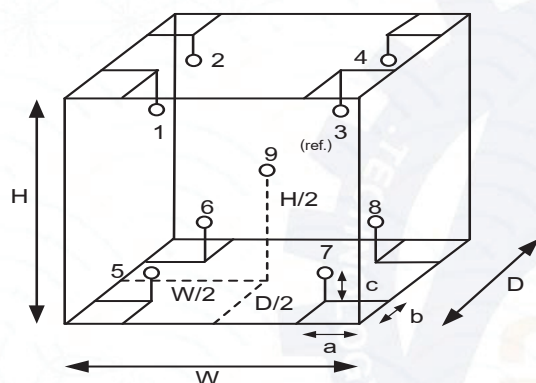
3. This measurement result is traceable to the International System of Unit maintained through :

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	21
REL.Humid. (%)	37	33
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	23-16RTD-04
5	19-16RTD-05
6	19-14RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.72 m³



Equipment : Low Temp. Incubator
Condition As-Received : New Item
Reference : 2603-0502OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 26TM461

Page : 3 of 3

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

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.185	20.132	20.303	20.160	20.001	20.054	19.983	20.060	20.163	0.30

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

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

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

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

UUC* : Unit Under Calibration

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

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

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Certificate of Calibration

Cert.No.: 25CG3668

Page.: 1 of 2

Equipment :	Burette
Capacity :	50 mL
Serial No. :	-
ID. No. :	RYG_EN0216
Manufacturer :	Witeg
Made in :	Germany
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch 616/10 Moo 5 T.MaenamKoo, A.Plukdaeng Rayong 21140, Thailand
Ambient Temperature :	(20 ± 2.5) °C
Relative Humidity :	(50 ± 10) %
Barometric Pressure :	753 mmHg
Calibration Procedure :	ASTM E 542 - 01
Calibrated by :	Srisuda Khamtha
Approved by :	 Approved Signatory
() Ponpan Paipim	
(✓) Chakrit Waewwanjua	

REVIEW BY *Thanitak*

APPROVED BY *D. Khamtha*

NEXT CAL DATE **18/09/26**

Issue Date : 19 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 : 18 September 2025
Reference : 2509-0564DSC-3

Cert.No.: 25CG3668

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID. No.</u>	<u>Certificate No.</u>	<u>Traceability</u>	<u>Due date</u>
1) Balance	XP205	B134206712	140RC007	25MM296	TPA	16 July 2026
2) Humidity/Baro/Temp	MHB-382SD	AM.42259	140EC016	25H1616	TPA	14 Aug 2026
3) Digital Thermometer	HH376	230806555	140EC013	25I1740	TPA	17 Jan 2026

This measurement result is traceable to SI Unit

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

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

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
10	10.0264	0.0082	2.00
25	25.0141	0.0087	2.00
50	49.9952	0.010	2.00

Remark mL = cm³

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

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Accredited by

NSC-TISI-TIS 17025

Calibration 0426



NSC-TISI-TIS 17025

CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 25BKL0002

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MCE224S-2S00-U	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	38101399 RYG_EN0163	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

REVIEW BY

Thanitak.

APPROVED BY

D. Khunon.

NEXT CAL DATE

20/02/26

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

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

Date 06 Mar 2025

Approval of the Calibration Certificate



Mr. Chonchai Inthana

Person in charge

Kachen Lalee

Calibration object

Single range instrument

Model	MCE224S-2S00-U
Serial Number	38101399
QM Ident. no Inventory no.	RYG_EN0163 ---

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

Place of calibration

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

Calibration procedure

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

Test equipment

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

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration Temp. diff. <i>T</i> _{weights} - <i>T</i> _{place}	24.4 °C 0.6 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 58.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

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

Eccentricity

Test load (nominal): 100 g	
Center	100.0000 g
Front left	100.0000 g
Back left	100.0000 g
Back right	100.0000 g
Front right	99.9999 g
Maximum deviation from centric loading indication $ \Delta_{ecc} _{max} = 0.0001\text{ g}$	

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U</i> (<i>E</i>)	<i>U</i> _{rel} (<i>E</i>)
0.0100 g	0.0100 g	0.0000 g	2.00	0.00013 g	1.3 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00013 g	0.13 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00013 g	0.026 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00013 g	0.013 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00013 g	0.0026 %
10.0000 g	9.9999 g	-0.0001 g	2.00	0.00013 g	0.0013 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00014 g	0.00068 %
50.0000 g	50.0001 g	0.0001 g	2.00	0.00015 g	0.00029 %
100.0000 g	100.0000 g	0.0000 g	2.00	0.00018 g	0.00018 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00028 g	0.00014 %
220.0000 g	220.0000 g	0.0000 g	2.00	0.00032 g	0.00015 %
Maximum error of indication		$ E _{max} = 0.0001\text{ g}$			

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

End of calibration certificate

Uncertainty of measurement in use

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

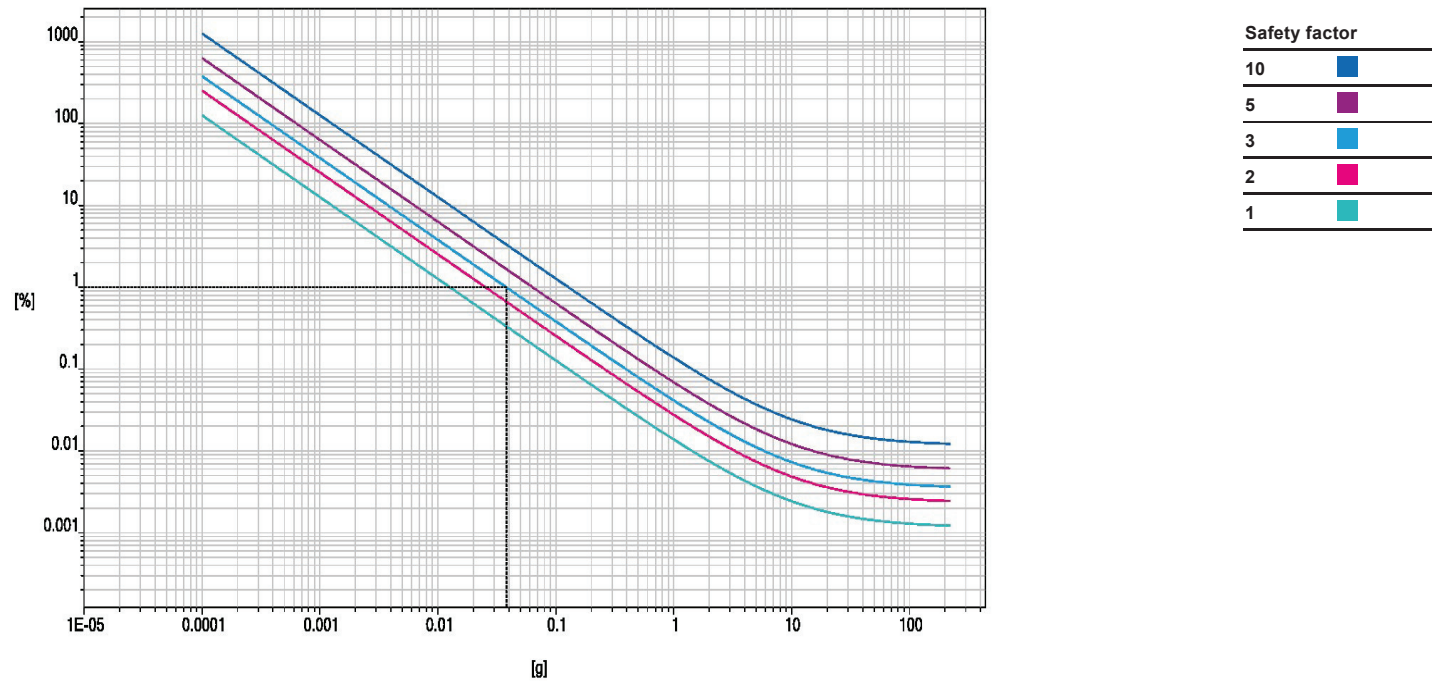
Uncertainty of the weighing result $U_{gl}(W)$

$U_{gl}(W) = 0.00013 \text{ g} + 1.16 \cdot 10^{-5} \cdot R$

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

Indication in % from max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00016 g	0.0071 %
25 %	55.0000 g	0.00077 g	0.0014 %
50 %	110.0000 g	0.0014 g	0.0013 %
75 %	165.0000 g	0.0020 g	0.0012 %
100 %	220.0000 g	0.0027 g	0.0012 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0381 g

Accredited by

NSC-TISI-TIS 17025

Calibration 0426



NSC-TISI-TIS 17025

CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 26BCI0064

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MCE224S-2S00-U	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	38101399 RYG_EN0163	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	278579	REVIEW BY <i>Thanita K.</i>
Number of pages	4	APPROVED BY <i>D. Johnson</i>
Date of calibration	03 Feb 2026	NEXT CAL DATE..... 03/02/27

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

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

Calibration object

Single range instrument

Model	MCE224S-2S00-U
Serial Number	38101399
QM Ident. no Inventory no.	RYG_EN0163 ---

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

Place of calibration

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

Calibration procedure

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

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	Testo 174H H/T250743 (Traceable to Si unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M2508149S ,E2(Traceable to SI unit through TCS)	19 Aug 2027

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	03 Feb 2026
Temperature at place of calibration Temp. diff. <i>T</i> _{weights} - <i>T</i> _{place}	25 °C 0.5 K
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 49.0 %RH.

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g 200 g		
	10 g	200 g
1	10.0000 g	200.0000 g
2	10.0000 g	199.9999 g
3	10.0000 g	200.0000 g
4	10.0000 g	200.0001 g
5	9.9999 g	199.9999 g
6	10.0000 g	200.0000 g
7	10.0000 g	199.9999 g
8	10.0000 g	200.0000 g
9	9.9999 g	200.0001 g
10	10.0000 g	200.0000 g
	<i>s</i> = 0.00004 g	<i>s</i> = 0.00007 g

Eccentricity

Test load (nominal): 100 g	
Center	100.0001 g
Front left	100.0002 g
Back left	100.0002 g
Back right	100.0000 g
Front right	100.0000 g
Maximum deviation from centric loading indication $ \Delta_{ecc} _{max} = 0.0001\text{ g}$	

Error of indication

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
<i>L</i>	<i>I</i>	<i>E</i>	<i>k</i>	<i>U(E)</i>	<i>U_{rel}(E)</i>
0.0100 g	0.0100 g	0.0000 g	2.00	0.00012 g	1.2 %
0.1000 g	0.1000 g	0.0000 g	2.00	0.00017 g	0.17 %
0.5000 g	0.5000 g	0.0000 g	2.00	0.00017 g	0.034 %
1.0000 g	1.0000 g	0.0000 g	2.00	0.00017 g	0.017 %
5.0000 g	5.0000 g	0.0000 g	2.00	0.00017 g	0.0034 %
10.0000 g	10.0000 g	0.0000 g	2.00	0.00017 g	0.0017 %
20.0000 g	20.0000 g	0.0000 g	2.00	0.00018 g	0.00088 %
50.0000 g	50.0000 g	0.0000 g	2.00	0.00018 g	0.00037 %
100.0000 g	100.0001 g	0.0001 g	2.00	0.00021 g	0.00021 %
200.0000 g	200.0000 g	0.0000 g	2.00	0.00030 g	0.00015 %
220.0000 g	220.0001 g	0.0001 g	2.00	0.00034 g	0.00015 %
Maximum error of indication		$ E _{max} = 0.0001\text{ g}$			

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

End of calibration certificate

Uncertainty of measurement in use

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

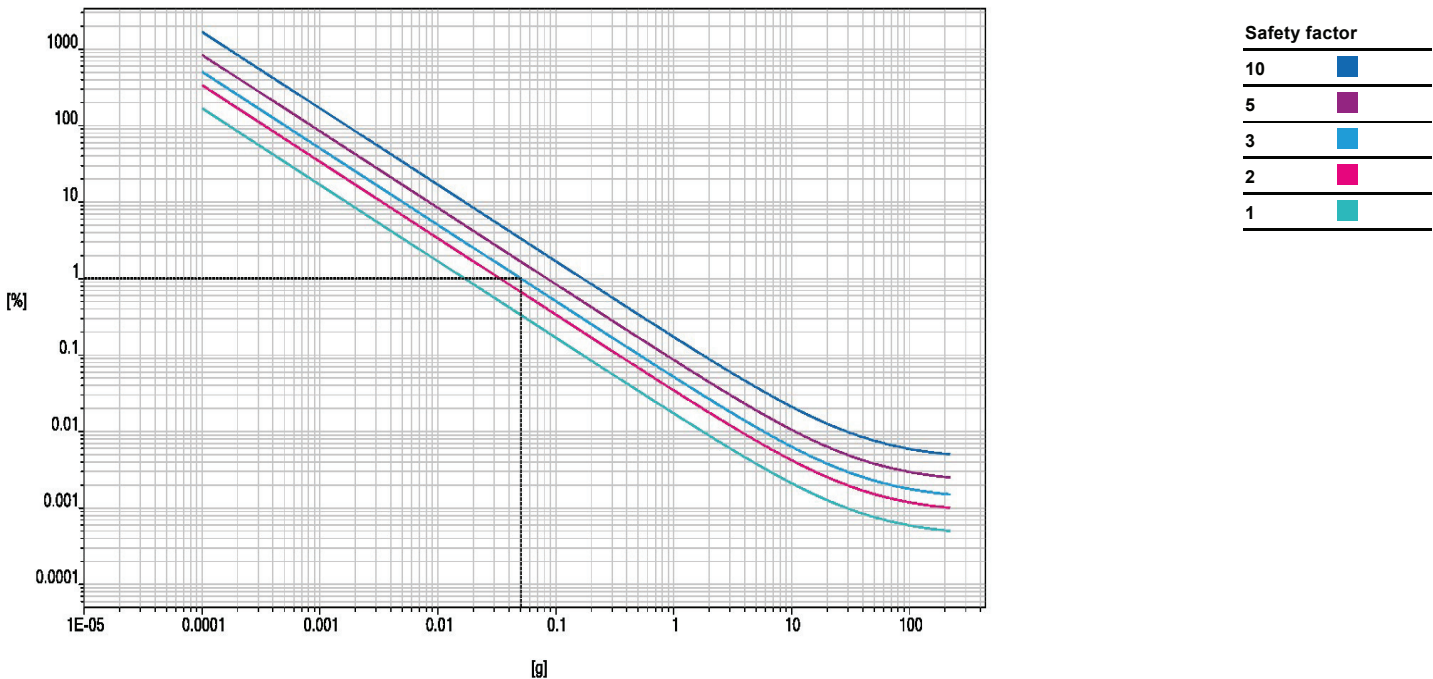
Uncertainty of the weighing result $U_{gl}(W)$

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

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

Indication in % from max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.2000 g	0.00018 g	0.0082 %
25 %	55.0000 g	0.00040 g	0.00073 %
50 %	110.0000 g	0.00064 g	0.00058 %
75 %	165.0000 g	0.00087 g	0.00053 %
100 %	220.0000 g	0.0011 g	0.00050 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.0507 g



Metrology Center
SCI ECO Services Company Limited

51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Bangkok Tel : +668 9205 6851 , +669 81924 0059

Saraburi Tel : +669 8247 2360

Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T251530

Page 1 of 3

Certificate of Calibration

Equipment : Chamber (Oven)

Manufacturer : MEMMERT

Model : UF 110

Serial No. : B416.2420

Customer Code : RYG_EN0012

ID No. : T6444A5

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

616/10 Moo 5 T.Maenamkoo,

A.Pluakdaeng, Rayong 21140

Customer Location : ENVIRONMENT LABORATORY

Date of Receipt : 3 September 2025

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

Approved By : Boonchai Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 17 SEP 2025



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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

Certificate No. T251530

Page 2 of 3

Calibration Report

Equipment : Chamber (Oven)
Date of Calibration : 10 September 2025
Environment : Temperature : 35.7-36.6 °C
Line Voltage : 226.8-233.7 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2019) and AS2853-1986).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	30-(CH1-10)	T242203	9 November 2025
DATA LOGGER	34970A	T47	T242203	9 November 2025

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.

4. Condition of calibrated item : good

Equipment Description :

Time Constant 3 Hour 29 Minute At 104 °C

Fresh Air Damper ☒ Open ☒ Min ☐ Medium ☐ Max

☐ Close

☐ Not Available

5. Adjustment :

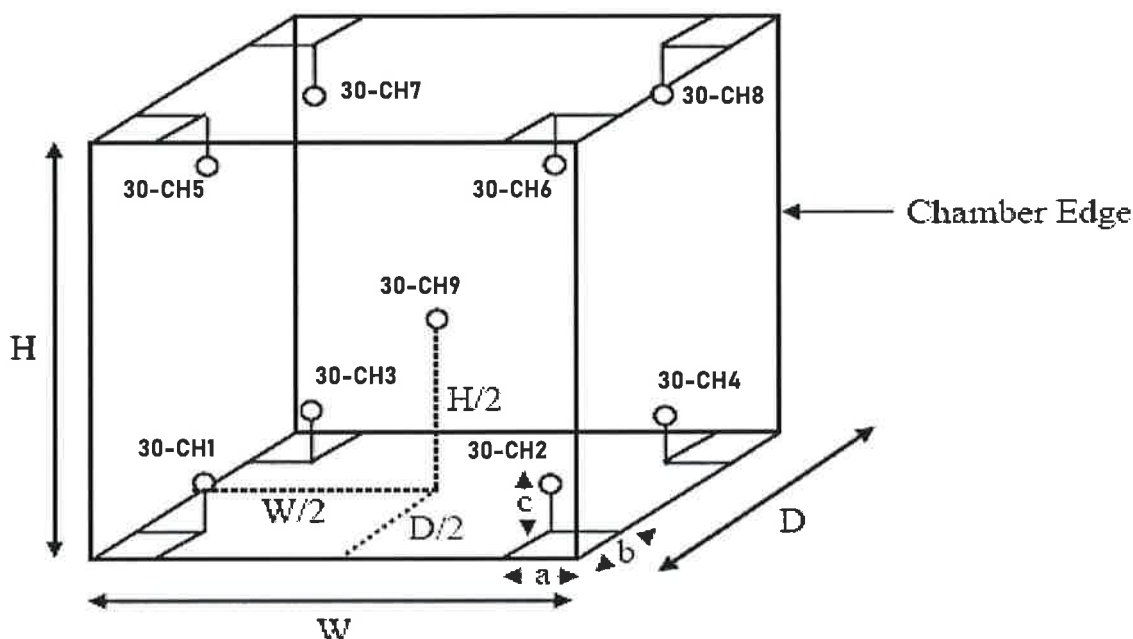
() without adjustment

(X) after adjustment

Approved By. _____



Calibration Report



Remark : Internal Dimensions of Chamber : W (Width) = 56 cm. , H (Height) = 48 cm. and D (Depth) = 40 cm.
 Size of Installed Standard sensor number 30-CH1 to number 30-CH8 : a = 5 cm. ,b = 5 cm. and c = 5 cm.
 Size of Installed Standard sensor number 30-CH9 : W/2 = 56 cm./2 , H/2 = 48 cm./2 and D/2 = 40cm./2

Measurement Results

Average Standard Reading at each position (°C)									
Calibration Point	30-CH1	30-CH2	30-CH3	30-CH4	30-CH5	30-CH6	30-CH7	30-CH8	30-CH9
104	104.02	103.70	104.01	104.16	104.11	104.08	104.01	104.33	103.61
180	180.67	178.78	180.38	179.85	179.16	180.27	180.98	181.04	179.49

Chamber (Oven)			Temperature Distribution				
Setting °C	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
104.0	103.9 , 104.1	104.0	104.00	0.08	0.61	0.42	2.00
180.0	179.9 , 180.1	180.0	180.07	0.21	1.51	0.52	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate.

Approved By. _____



Accredited by

NSC-TISI-TIS 17025

Calibration 0426



NSC-TISI-TIS 17025

CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 25BKL0003

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSU224S-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	31709552 RYG_EN0003	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

REVIEW BY

Thanitak.

APPROVED BY

D. Khunon.

NEXT CAL DATE

20/02/26

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

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

Date 06 Mar 2025

Approval of the Calibration Certificate



Mr. Chonchai Inthana

Person in charge

Kachen Lalee

Calibration object

Single range instrument

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

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

Place of calibration

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

Calibration procedure

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

Test equipment

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

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

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

Measurement results | Measurement uncertainties

Repeatability

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

Eccentricity

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

Error of indication

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

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

End of calibration certificate

Uncertainty of measurement in use

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

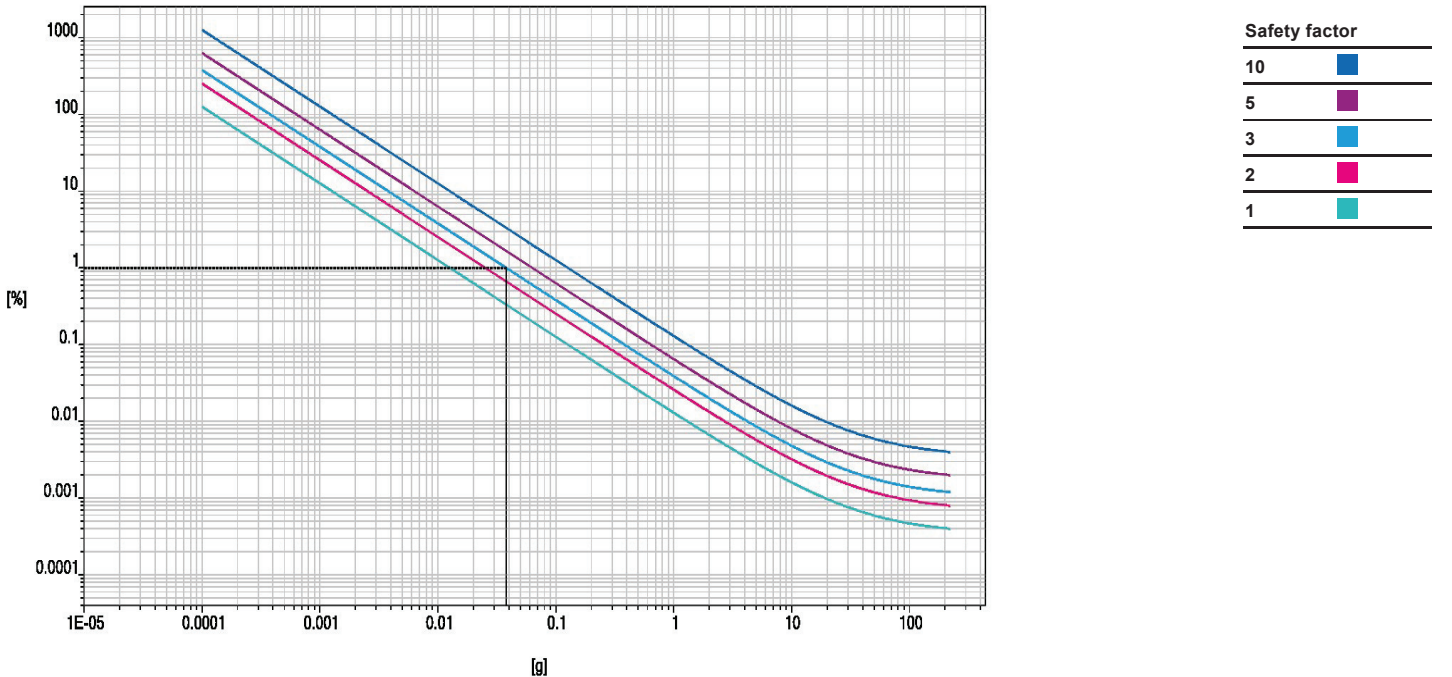
Uncertainty of the weighing result $U_{gl}(W)$

$U_{gl}(W) = 0.00013 \text{ g} + 3.42 \cdot 10^{-6} \cdot R$

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

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

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

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

Accredited by

NSC-TISI-TIS 17025

Calibration 0426



NSC-TISI-TIS 17025

CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 26BCI0066

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSU224S-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	31709552 RYG_EN0003	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	278579	REVIEW BY <i>Thanitak.</i>
Number of pages	4	APPROVED BY <i>D. Johnson.</i>
Date of calibration	03 Feb 2026	NEXT CAL DATE..... 03/02/27

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

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

Calibration object

Single range instrument

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

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

Place of calibration

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

Calibration procedure

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

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	Testo 174H H/T250743 (Traceable to Si unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M2508149S ,E2(Traceable to SI unit through TCS)	19 Aug 2027

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

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

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 10 g 200 g		
	10 g	200 g
1	10.0000 g	200.0000 g
2	10.0000 g	200.0001 g
3	10.0000 g	200.0001 g
4	10.0001 g	200.0001 g
5	10.0000 g	200.0001 g
6	10.0000 g	200.0000 g
7	10.0000 g	200.0000 g
8	10.0000 g	200.0000 g
9	10.0000 g	200.0000 g
10	10.0000 g	200.0000 g
	<i>s</i> = 0.00003 g	<i>s</i> = 0.00005 g

Eccentricity

Test load (nominal): 100 g	
Center	100.0000 g
Front left	100.0000 g
Back left	99.9999 g
Back right	100.0000 g
Front right	100.0000 g
Maximum deviation from centric loading indication $ \Delta_{ecc} _{max} = 0.0001\text{ g}$	

Error of indication

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

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

End of calibration certificate

Uncertainty of measurement in use

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

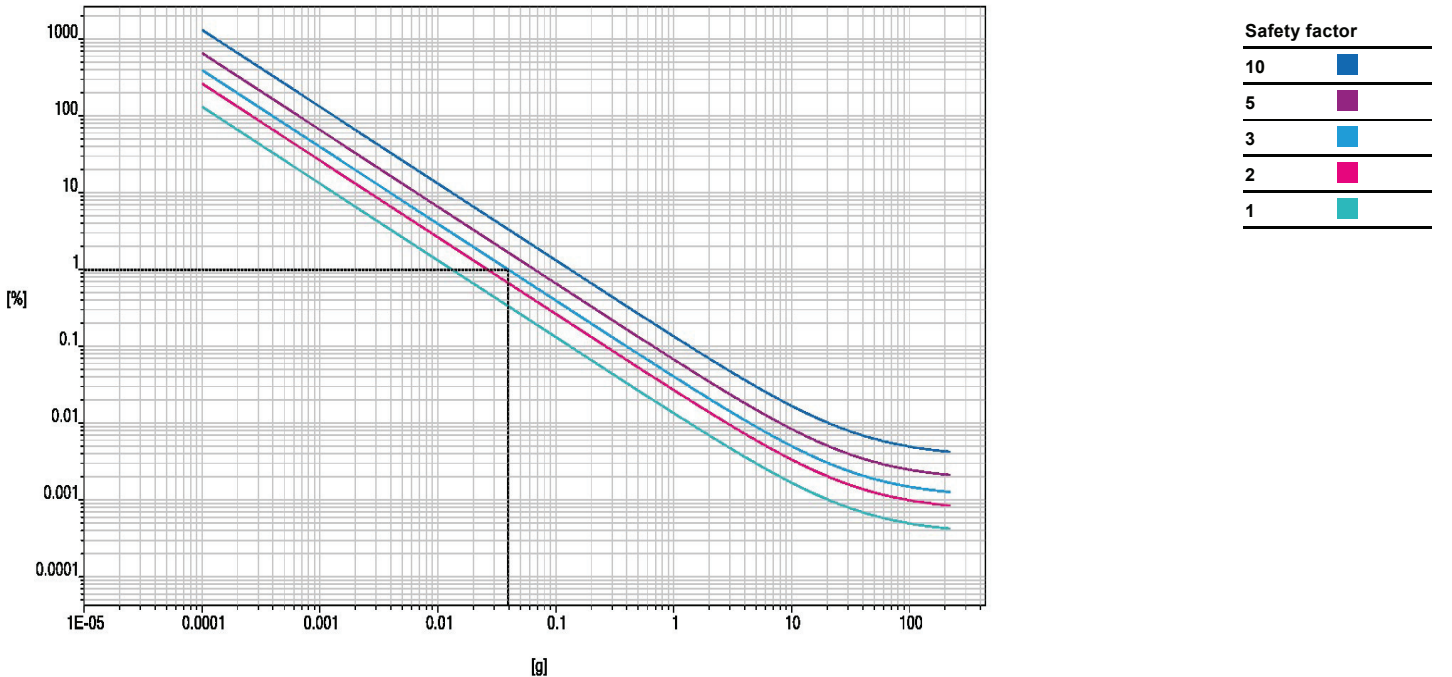
Uncertainty of the weighing result $U_{gl}(W)$

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

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

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

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

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



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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T252169

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Certificate of Calibration

Equipment : Liquid Bath (Water)

Manufacturer : Memmert

Model : WNE29

Serial No. : L623.0105

Customer Code : RYG_EN0220

ID No. : T5650A5

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

Customer Location : Wet Chemistry Lab

Date of Receipt : 19 November 2025

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 01 DEC 2025

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

Certificate No. T252169

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Calibration Report

Equipment : Liquid Bath (Water)
Date of Calibration : 27 November 2025
Environment : Temperature : 25.5-25.7 °C
Line Voltage : 221.8-225.5 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 (based on ASTM E715-80 (Reapproved 2022)).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M18 (CH1-CH5)	T251758	17 October 2026
DATA LOGGER	34970A	T261	T251758	17 October 2026

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour 3 Minute At 63 °C

5. Adjustment :

(X) without adjustment

() after adjustment

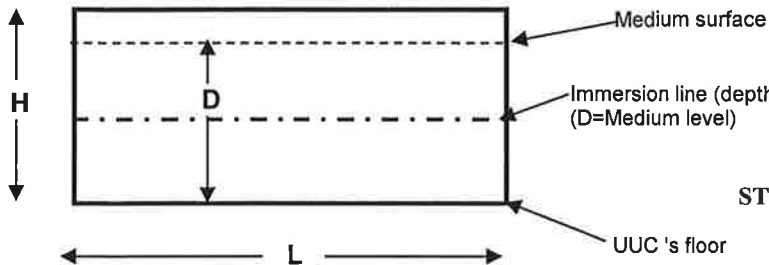
Approved By. _____

Certificate No. T252169

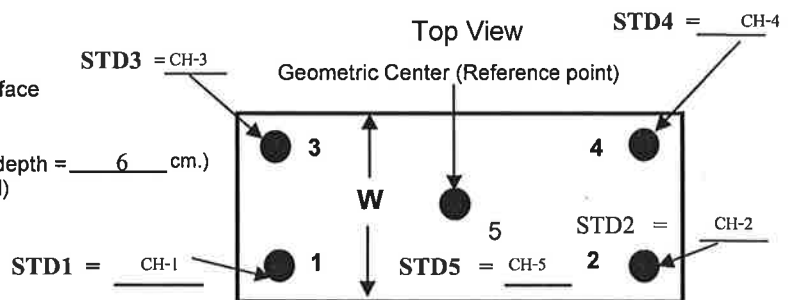
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Calibration Report

Side View



Top View



- D = Medium level : 12 cm.

- UUC 's medium : Water

- Working standards are located at 2.5 cm. away from each corner and walls.

Working space dimension : 59 × 35 × 14 (WxLxH)

Measurement Results:

Calibration Point	Average Standard Reading at each position (° C)				
	CH-1	CH-2	CH-3	CH-4	CH-5
63	62.93	63.13	62.94	63.10	63.09
85	85.15	85.33	85.21	85.43	85.20

Liquid Bath (Water)			Temperature Distribution				
Setting (° C)	Reading (° C)		Average (° C)	Stability (± ° C)	Uniformity (± ° C)	Uncertainty (± ° C)	Coverage Factor <i>k</i>
	Min , Max	Average					
63.0	62.9 , 63.1	63.0	63.04	0.08	0.17	0.27	2.06
85.0	84.8 , 85.2	85.0	85.26	0.13	0.24	0.43	2.23

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate.

Approved By. 