

ภาคผนวก จ  
เอกสารสอบเทียบเครื่องมือวัด

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## List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
<b>Ambient</b>									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Tisch Environmental,Inc.	TE-5025A 3540	Jiranatee Associates Co., Ltd.	COF-045-67	4 Nov 24	3 Nov 25	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	25P1541	24 Apr 25	23 Apr 26	-
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	25P1379	17 Apr 25	16 Apr 26	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM <sub>10</sub> )	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	25H812	10 Apr 25	9 Apr 26	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1201778108	UAE Consultant Co.,Ltd.	04112024	4 Oct 24	3 Oct 25	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1201778110	UAE Consultant Co.,Ltd.	17102024	17 Oct 24	16 Oct 25	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1200636462	UAE Consultant Co.,Ltd.	04102024	4 Oct 24	3 Oct 25	-
8	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920005	UAE Consultant Co.,Ltd.	07052025	7 May 25	6 May 26	-
9	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jul 23	6 Jul 31	-
10	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1182920016	UAE Consultant Co.,Ltd.	12052025	12 May 25	11 May 26	-
11	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1182920017	UAE Consultant Co.,Ltd.	07052025	6 May 25	5 May 26	-
12	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1180540065	UAE Consultant Co.,Ltd.	12052025	12 May 25	11 May 26	-
13	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387067	UAE Consultant Co.,Ltd.	06052025	6 May 25	5 May 26	-
14	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jul 23	6 Jul 31	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
15	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497732	UAE Consultant Co.,Ltd.	09072025	9 Jul 25	8 Jul 26	-
16	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201497733	UAE Consultant Co.,Ltd.	17072025	17 Jul 25	16 Jul 26	-
17	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778118	UAE Consultant Co.,Ltd.	12122024	12 Dec 24	11 Dec 25	-
18	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778119	UAE Consultant Co.,Ltd.	06122024	6 Dec 24	5 Dec 25	-
19	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jul 23	6 Jul 31	-
20	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14546	Calibration Laboratory Co.Ltd	Q24127999A1	4 Dec 24	3 Dec 25	-
21	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14466	Calibration Laboratory Co.Ltd	Q24128001A1	4 Dec 24	3 Dec 25	-
22	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14467	Calibration Laboratory Co.Ltd	Q24128000A1	4 Dec 24	3 Dec 25	-
23	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14472	Calibration Laboratory Co.Ltd	Q24127998A1	4 Dec 24	3 Dec 25	-
24	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL200 21091	Innovative Instrument Co.,Ltd.	25-ACT-074	20 May 25	19 May 26	-
25	Sound Level Meter	L <sub>Aeq</sub> 24 hrs, L <sub>Aeq</sub> 1 hr, L <sub>Amax</sub> , L <sub>A90</sub> , L <sub>Adn</sub>	Larson Davis	LxT2 0005286	Innovative Instrument Co.,Ltd.	25-SLM-272	11 Aug 25	10 Aug 27	-
26	Sound Level Meter	L <sub>Aeq</sub> 24 hrs, L <sub>Aeq</sub> 1 hr, L <sub>Amax</sub> , L <sub>A90</sub> , L <sub>Adn</sub>		LxT2 0005287	Innovative Instrument Co.,Ltd.	25-SLM-241	29 Jul 25	28 Jul 27	-
27	Sound Level Meter	L <sub>Aeq</sub> 24 hrs, L <sub>Aeq</sub> 1 hr, L <sub>Amax</sub> , L <sub>A90</sub> , L <sub>Adn</sub>	Larson Davis	LxT2 0005288	Innovative Instrument Co.,Ltd.	25-SLM-242	29 Jul 25	28 Jul 27	-
28	Sound Level Meter	L <sub>Aeq</sub> 24 hrs, L <sub>Aeq</sub> 1 hr, L <sub>Amax</sub> , L <sub>A90</sub> , L <sub>Adn</sub>		LxT2 0005298	Electrical And Electronics Institute Foundation For Industrial Development	CP20240341EA	23 Sep 24	22 Sep 26	-

## CERTIFICATE OF CALIBRATION

Certificate No. : COF-045-67

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER : Top Load Office  
MODEL/TYPE : TSOCH  
SERIAL NUMBER : TE-S025A  
ID NUMBER : 3540  
CONDITION AS-RECEIVED : UAE-ETM-L76/2561  
CUSTOMER : Used Item  
United Analyst and Engineering Consultant Co., Ltd.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,  
Bangkok 10260

RECEIVED DATE : 24 Oct 2024  
MEASUREMENT DATE : 04 Nov 2024  
ISSUE DATE : 05 Nov 2024

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:  
Temperature :  $23.0 \pm 0.2$  °C  
Relative Humidity :  $55.0 \pm 15.0$  %RH  
Atmospheric Pressure :  $1010 \pm 10$  hPa

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are  $23.7$  °C and  $49.7$  %RH.

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

### TABULATION OF RESULTS:

The table on next page give the measured values.

### Calibration procedure:

The Office gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model: GSGMACW040. The MW-CL-004 was used as a calibration guideline.

### Traceability:

This certificate provides a traceability of the measurement to recognized the national standards and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MN-0063-23.

### Uncertainty of Measurement:

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

### MEASUREMENT RESULTS:

The Office gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The humid air was used as a medium in the system. The standard conditions are  $25$  °C ( $298.15$  K) and  $760$  mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [T <sub>a</sub> ] °C	Temperature [T <sub>m</sub> ] °C	Ap <sub>meter</sub> mmHg	Ap <sub>Office</sub> inH <sub>2</sub> O	y	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.702	755.241	23.67	22.27	57.134	1.612	1.258	0.651
2	1.000	755.312	23.55	22.71	61.321	1.748	1.401	0.920
3	1.117	755.324	23.36	22.72	61.180	1.809	1.501	1.058
4	1.163	755.363	23.17	22.77	60.028	1.806	1.574	1.119
5	1.417	755.397	23.65	23.10	79.199	2.191	1.681	1.365

Slope (m): 1.98270

Intercept (b): -0.02316

Correlation coefficient (r): 0.99988

Uncertainty (k=2): 0.015 m<sup>3</sup>/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m <sup>3</sup> /min	Pressure [Pa] mmHg	Temperature [T <sub>a</sub> ] °C	Temperature [T <sub>m</sub> ] °C	Ap <sub>meter</sub> mmHg	Ap <sub>Office</sub> inH <sub>2</sub> O	y	Standard Flow [Q <sub>s</sub> ] m <sup>3</sup> /min
1	0.702	755.241	23.67	22.27	57.134	1.612	0.796	0.652
2	1.000	755.312	23.55	22.71	61.321	1.748	1.129	0.921
3	1.117	755.324	23.36	22.72	61.180	1.809	1.301	1.058
4	1.163	755.363	23.17	22.77	60.028	1.806	1.574	1.119
5	1.417	755.397	23.65	23.10	79.199	2.191	1.681	1.365

Slope (m): 1.24186

Intercept (b): -0.01454

Correlation coefficient (r): 0.99988

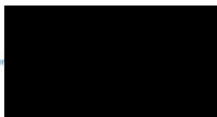
Uncertainty (k=2): 0.015 m<sup>3</sup>/min

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

Calibrated by:  
☐ Mr. Sorawit Thachalad  
☒ Miss Jiraporn Lertsamphol



Approved signature



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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLIANG, BANGKOK 10250  
TEL. 0-2717-3800-24 FAX. 0-2719-9484

## Certificate of Calibration

Certificate No. : 25P1541  
Page : 1 of 2

Equipment : U Tube Manometer

Manufacturer : Dwyer

Model : 1221-36-W/M

Serial No. : -

ID No. : UAE-ETM.077/2586

Condition As-Received: Used Item

Received Date: 04 April 2025

Calibration Date: 24 April 2025

Reference: 2504-0192WSC

Ambient Temperature: ( $23 \pm 2$ ) °C

Relative Humidity: ( $50 \pm 15$ ) %

Atmospheric Pressure: 1005 mbar

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,

Phrakhanong, Bangkok 10260

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

### Condition of this result of calibration

1. Reference standards instruments :

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

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

3. Scale and conversion factor is 1 kPa = 4.0148293 inH<sub>2</sub>O

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

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

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

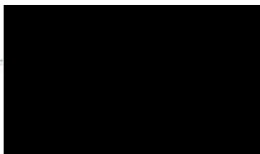
7. The certificate is valid only to the item calibrated on date and place of calibration.

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

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

Calibrated by : Suksan Khankasri  
Issue Date : 28 April 2025

Approved Signatory



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Cert.No.: 25P1541  
Page: 2 of 2

Result of calibration: Without adjustment  
Function: Pressure Measurement  
Increasing Pressure

Range: 0 inH<sub>2</sub>O to 36 inH<sub>2</sub>O  
Scale Interval: 0.1 inH<sub>2</sub>O (The Second Estimate)

Applied Pressure	High-port side	Low-port side	UUC Indication	ΔP	Error
0.00	0.00	0.00	0.00	0.00	0.00
2.05	1.00	-1.00	2.00	-0.05	-0.05
4.06	2.00	-2.00	4.00	-0.05	-0.05
6.05	3.00	-3.00	6.00	-0.05	-0.05
8.03	4.00	-4.00	8.00	-0.03	-0.03
9.98	5.00	-5.00	10.00	0.02	0.02
11.97	6.00	-6.00	12.00	0.03	0.03
13.97	7.00	-7.00	14.00	0.03	0.03
15.96	8.00	-8.00	16.00	0.04	0.04
17.95	9.00	-9.00	18.00	0.05	0.05
19.93	10.00	-10.00	20.00	0.07	0.07
21.93	11.00	-11.00	22.00	0.07	0.07
23.89	12.00	-12.00	24.00	0.11	0.11
25.89	13.00	-13.00	26.00	0.11	0.11
27.85	14.00	-14.00	28.00	0.15	0.15
29.85	15.00	-15.00	30.00	0.15	0.15
31.85	16.00	-16.00	32.00	0.15	0.15
33.85	17.00	-17.00	34.00	0.15	0.15
35.85	18.00	-18.00	36.00	0.15	0.15

The uncertainty of measurement was  $\pm 0.11$  inH<sub>2</sub>O

\* ΔP = High-port side - Low-port side

\* UUC = Unit Under Calibration

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

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## Certificate of Calibration

Certificate No.: 25P1379  
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.121/2550

Condition As-Received: Used Item

Received Date: 04 April 2025

Calibration Date: 17 April 2025

Reference: 2504-0196WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: ( 23 ± 2 ) °C

Relative Humidity: ( 50 ± 15 ) %

Atmospheric Pressure: 1005 mbar

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Corporate Services 3: Equipment Calibration and Testing Services.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,  
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments  
Standard according to calibration procedure CP-P10, using "DKD-R 6-1 : Calibration of Pressure Gauges " as  
a guidelines.

### Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0133-24	15 May 2025

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

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

4.This result of calibration instrument was in absolute pressure.

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

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Kaerpon Saivichai  
Issue Date : 21 April 2025

Approved Signatory :



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Cert.No.: 25P1379  
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Range: 960 hPa to 1070 hPa

Scale Interval: 1 hPa ( The Fifth Estimate )

Increasing Pressure

Applied Pressure (hPa)	959.71	971.22	982.18	991.71	1003.10	1006.94	1013.02	1023.08	1034.17	1068.92
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1005.0	1010.0	1020.0	1030.0	1060.0
Error (hPa)	0.29	-1.22	-2.18	-1.71	-3.10	-1.94	-3.02	-3.06	-4.17	-8.92

Decreasing Pressure

Applied Pressure (hPa)	1069.95	1033.45	1022.77	1012.49	1007.16	1002.58	992.32	982.17	970.86	959.47
UUC* Indication (hPa)	1060.0	1030.0	1020.0	1010.0	1005.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-8.95	-3.45	-2.77	-2.49	-2.16	-2.58	-2.32	-2.17	-0.86	0.53

The uncertainty of measurement was ± 0.33 hPa

\* UUC = Unit Under Calibration

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

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## Certificate of Calibration

Certificate No.: 25H812  
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.132/2550

Condition As-Received: Used Item

Received Date: 04 April 2025

Calibration Date: 10 April 2025

Reference: 2504-0193WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: ( 25 ± 3 ) °C

Relative Humidity: ( 50 ± 20 ) %

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Corporate Services 3: Equipment Calibration and Testing Services.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,  
Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison  
with standard chilled mirror sensor for humidity measurement function and comparison with standard  
temperature probe for temperature measurement function into humidity / temperature chamber.

### Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Dew Point Hygrometer	Optidew 401	164756	TH-0005-25	05 Feb 2026
2) Handheld Thermometer With Sensor	1523	5717096	2411241	18 Nov 2025

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

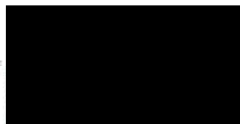
3.This Certification is traceable to the International System of Unit maintained through:-

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

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

Calibrated by : Senchal Dumvor  
Issue Date : 18 April 2025

Approved Signatory :



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Cert. No.: 25H812  
Page: 2 of 2

Result of Calibration:-

Without Adjustment

Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Correction (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	42	-1.9	1.7
25.0	60.0	60	0.0	1.8
25.0	80.0	76	4.0	1.9

Result of Calibration:-

Without Adjustment

Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty of Measurement (±°C)
20.001	21.0	-0.999	0.72
24.987	25.0	-0.013	0.72
30.021	30.0	0.021	0.72
34.964	34.0	0.964	0.72
40.032	39.0	1.032	0.72

UUC\* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied  
by coverage factor k = 2.00, providing confidence level approximately 95%.

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### MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42i  
Manufacturer : Thermo Scientific Serial Number : 1201778108

#### Standard Gas Concentration

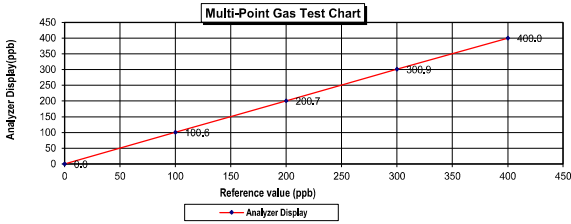
Sulphur Dioxide (SO<sub>2</sub>) 42.89 PPM  
Nitric Oxide (NO) 46.77 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 965.9 PPM  
Cylinder No. : EB0159156  
Expiration Date : Nov 6, 2026

#### Dilutor Detail

Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

#### Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.6	0.60	0.60
Level 3	40.00%	200.0	200.7	0.70	0.35
Level 4	60.00%	300.0	300.9	0.90	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.25
			:Acceptable Limit $\pm$ 5%		



### MULTI-POINT GAS TEST REPORT

Test Date : Oct 17, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42i  
Manufacturer : Thermo Scientific Serial Number : 1201778110

#### Standard Gas Concentration

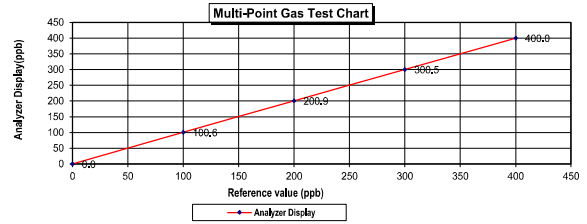
Sulphur Dioxide (SO<sub>2</sub>) 42.89 PPM  
Nitric Oxide (NO) 46.77 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 965.9 PPM  
Cylinder No. : EB0159156  
Expiration Date : Nov 6, 2026

#### Dilutor Detail

Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

#### Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.6	0.60	0.60
Level 3	40.00%	200.0	200.9	0.90	0.45
Level 4	60.00%	300.0	300.5	0.50	0.17
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.24
			:Acceptable Limit $\pm$ 5%		



### MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42i  
Manufacturer : Thermo Scientific Serial Number : 1200636462

#### Standard Gas Concentration

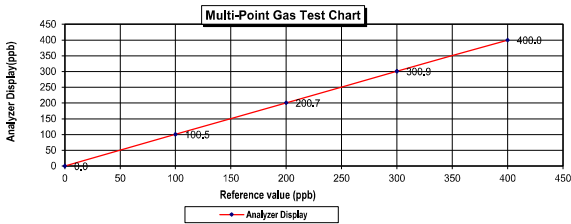
Sulphur Dioxide (SO<sub>2</sub>) 42.89 PPM  
Nitric Oxide (NO) 46.77 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 965.9 PPM  
Cylinder No. : EB0159156  
Expiration Date : Nov 6, 2026

#### Dilutor Detail

Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

#### Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.5	0.50	0.50
Level 3	40.00%	200.0	200.7	0.70	0.35
Level 4	60.00%	300.0	300.9	0.90	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.23
			:Acceptable Limit $\pm$ 5%		



### MULTI-POINT GAS TEST REPORT

Test Date : May 7, 2025

Equipment : Gas Analyzer (NO<sub>2</sub>) Model : 42i  
Manufacturer : Thermo Scientific Serial Number : 1182920005

#### Standard Gas Concentration

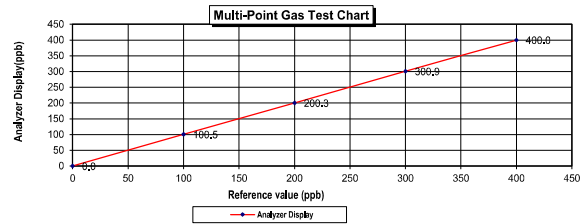
Sulphur Dioxide (SO<sub>2</sub>) 42.89 PPM  
Nitric Oxide (NO) 46.77 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 965.9 PPM  
Cylinder No. : EB0159156  
Expiration Date : Nov 6, 2026

#### Dilutor Detail

Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

#### Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.5	0.50	0.50
Level 3	40.00%	200.0	200.3	0.30	0.15
Level 4	60.00%	300.0	300.9	0.90	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.19
			:Acceptable Limit $\pm$ 5%		





## CERTIFICATE OF ANALYSIS

## Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)  
LTD--  
Part Number: E05N191E15A0014  
Cylinder Number: EB0162121  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12023  
Gas Code: CO, CO2, NO, NOX, SO2, BALN

Reference Number: 160-40272205-1  
Cylinder Volume: 144.0 CF  
Cylinder Pressure: 2016 PSIG  
Valve Outlet: 660  
Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PPM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2026
GMS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PPM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
GMS	153400202002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003820	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

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

ANALYTICAL EQUIPMENT			
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration	
Nicolet iS50 FTIR AUP2010245 CO2	FTIR	Jun 15, 2023	
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023	
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023	
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023	
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023	

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## MULTI-POINT GAS TEST REPORT

Test Date : May 12, 2025

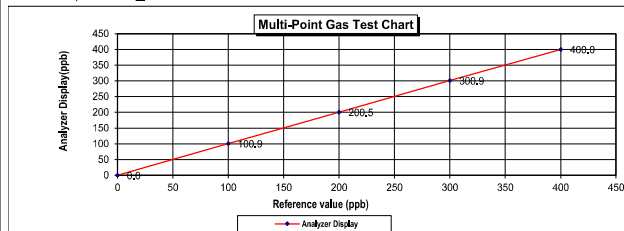
Equipment : Gas Analyzer (SO<sub>2</sub>)      Model : 43i  
Manufacturer : Thermo SCIENTIFIC      Serial Number : 1182920016

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

## Multi-point gas test data

	Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.5	0.50	0.25	0.25
Level 4	60.00%	300.0	300.9	0.90	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00

Remark : Measuring Range 500.0 ppb      Average Difference (%) 0.29  
:Acceptable Limit  $\pm 5\%$



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## MULTI-POINT GAS TEST REPORT

Test Date : May 6, 2025

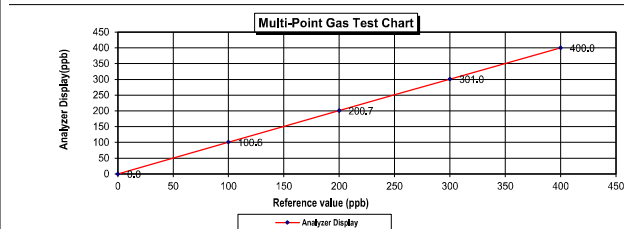
Equipment : Gas Analyzer (SO<sub>2</sub>)      Model : 43i  
Manufacturer : Thermo SCIENTIFIC      Serial Number : 1182920017

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

## Multi-point gas test data

	Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.6	0.60	0.60	0.60
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	301.0	1.00	0.33	0.33
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00

Remark : Measuring Range 500.0 ppb      Average Difference (%) 0.26  
:Acceptable Limit  $\pm 5\%$



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## MULTI-POINT GAS TEST REPORT

Test Date : May 12, 2025

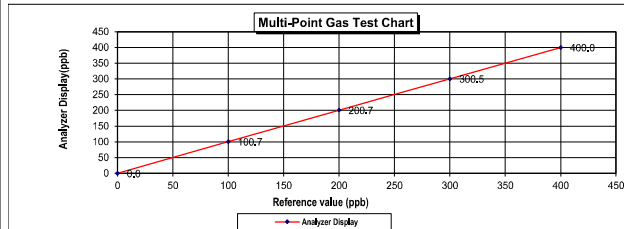
Equipment : Gas Analyzer (SO<sub>2</sub>)      Model : 43i  
Manufacturer : Thermo SCIENTIFIC      Serial Number : 1180540065

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

## Multi-point gas test data

	Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	300.5	0.50	0.17	0.17
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00

Remark : Measuring Range 500.0 ppb      Average Difference (%) 0.24  
:Acceptable Limit  $\pm 5\%$



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### MULTI-POINT GAS TEST REPORT

Test Date : May 6, 2025

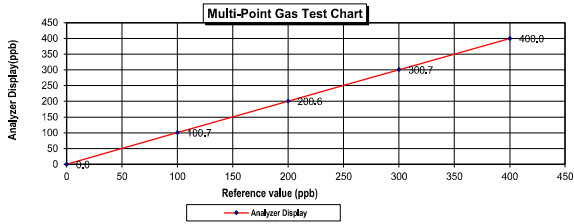
Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387067

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9	PPM		
Cylinder No. :	EB0159156			
Expiration Date :	Nov 06, 2026			

#### Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.6	0.60	0.30
Level 4	60.00%	300.0	300.7	0.70	0.23
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.25

:Acceptable Limit  $\pm 5\%$



### CERTIFICATE OF ANALYSIS

#### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)  
LTD:-  
Part Number: E05N191E15A0014 Reference Number: 160-402772205-1  
Cylinder Number: EB0162121 Cylinder Volume: 144.0 CF  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2016 PSIG  
PGVP Number: A12023 Valve Outlet: 660  
Gas Code: CO, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, BALN Certification Date: Jul 06, 2023

Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasoline Calibration Standards (May 2012)" document EPA 800R-12(51), using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results result only in the terms listed. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig. (i.e. 0.7 megapascals)

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	+/- 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	+/- 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	+/- 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	+/- 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Jan 04, 2031
PRM	C2219101	APE1514548	100.19 PPM NITRIC OXIDE/NITROGEN	+/- 0.3%	Feb 28, 2026
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	+/- 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Feb 17, 2023
PRM	15340020202	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003820	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
CO	230601	CC745902	248.47 PPM CARBON MONOXIDE/NITROGEN	+/- 0.3%	Dec 09, 2028
NTRM	130806-02	CC4111730	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 14, 2025

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Nicolet iS50 FTIR AUP2010245 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMAT6E N1-C8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023

### MULTI-POINT GAS TEST REPORT

Test Date : July 9, 2025

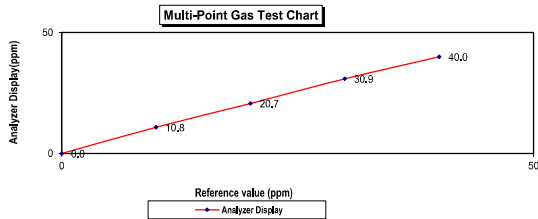
Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1201497732

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9	PPM		
Cylinder No. :	EB0159156			
Expiration Date :	Nov 06, 2026			

#### Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.8	0.8	7.4
Level 3	40.00%	20.0	20.7	0.7	3.4
Level 4	60.00%	30.0	30.9	0.9	2.9
Level 5	80.00%	40.0	40.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)		2.74

:Acceptable Limit  $\pm 5\%$



### MULTI-POINT GAS TEST REPORT

Test Date : July 17, 2025

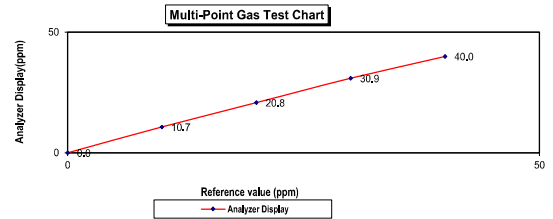
Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : 1201497733

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9	PPM		
Cylinder No. :	EB0159156			
Expiration Date :	Nov 06, 2026			

#### Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.7	0.7	6.5
Level 3	40.00%	20.0	20.8	0.8	3.8
Level 4	60.00%	30.0	30.9	0.9	2.9
Level 5	80.00%	40.0	40.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)		2.66

:Acceptable Limit  $\pm 5\%$





### MULTI-POINT GAS TEST REPORT

Test Date : Dec 12, 2024

Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778118

#### Standard Gas Concentration

Sulphur Dioxide (SO<sub>2</sub>) 42.89 PPM  
Nitric Oxide (NO) 46.77 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 965.9 PPM  
Cylinder No. : EB011591556  
Expiration Date : Nov 06, 2026

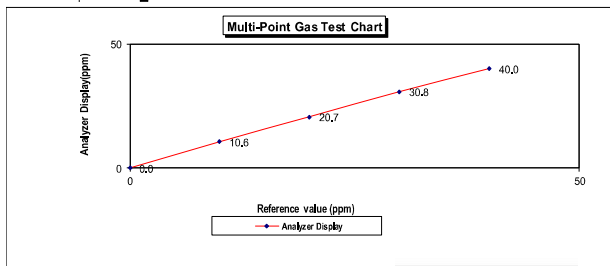
#### Dilutor Detail

Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

#### Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.6	0.6	5.7
Level 3	40.00%	20.0	20.7	0.7	3.4
Level 4	60.00%	30.0	30.8	0.8	2.6
Level 5	80.00%	40.0	40.0	0.0	0.0

Remark : Measuring Range 50.0 ppm  
:Acceptable Limit  $\pm$  5%



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### MULTI-POINT GAS TEST REPORT

Test Date : Dec 6, 2024

Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778119

#### Standard Gas Concentration

Sulphur Dioxide (SO<sub>2</sub>) 42.89 PPM  
Nitric Oxide (NO) 46.77 PPM  
Methane (CH<sub>4</sub>) - PPM  
Carbon Monoxide (CO) 965.9 PPM  
Cylinder No. : EB011591556  
Expiration Date : Nov 06, 2026

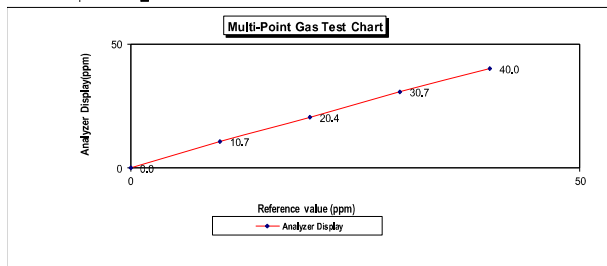
#### Dilutor Detail

Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

#### Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.7	0.7	6.5
Level 3	40.00%	20.0	20.4	0.4	2.0
Level 4	60.00%	30.0	30.7	0.7	2.3
Level 5	80.00%	40.0	40.0	0.0	0.0

Remark : Measuring Range 50.0 ppm  
:Acceptable Limit  $\pm$  5%



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

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)  
LTD--  
Part Number: E05NI91E15A0014  
Cylinder Number: EB0182121  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12023  
Gas Code: CO, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, BALN  
Reference Number: 160-402772205-1  
Cylinder Volume: 144.0 CF  
Cylinder Pressure: 2016 PSIG  
Valve Outlet: 660  
Certification Date: Jul 06, 2023  
Expiration Date: Jul 06, 2031

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasoline Calibration Standards (May 2012)" document EPA 800/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig, i.e. 0.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	$\pm$ 0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	$\pm$ 0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	$\pm$ 1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	$\pm$ 0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8,000 %	7,982 %	G1	$\pm$ 1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

#### CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CC754364	98.36 PPM NITRIC OXIDE/NITROGEN	$\pm$ 0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	$\pm$ 0.3%	Feb 28, 2025
GMIS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	$\pm$ 0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	$\pm$ 1.5%	Feb 17, 2023
GMIS	153406202002	EB0130037	9.693 PPM NITROGEN DIOXIDE/NITROGEN	$\pm$ 1.6%	Sep 29, 2025
NTRM	160102-22	KAL003820	97.69 PPM SULFUR DIOXIDE/NITROGEN	$\pm$ 0.8%	Nov 01, 2027
CO	235601	CC745902	245.47 PPM CARBON MONOXIDE/NITROGEN	$\pm$ 0.3%	Dec 09, 2028
NTRM	130606-02	CCA11730	13.359 % CARBON DIOXIDE/NITROGEN	$\pm$ 0.6%	May 14, 2025

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

#### ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Nicolet iS50 FTIR AUP2010245 CO <sub>2</sub>	FTIR	Jun 15, 2023
SIEMENS ULTRAMATE N1-C8-180	NDIR	Jun 14, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicolet iS50 FTIR AUP2010245 NO <sub>2</sub>	FTIR	Jun 15, 2023
Nicolet iS50 FTIR AUP2010245 SO <sub>2</sub>	FTIR	Jun 08, 2023



CALIBRATION LABORATORY CO., LTD.

210/11-14/15 Soi Phrasen Mankul 23 Yark 4, Phrasen Mankul Rd., Ladphrasa, Bangkok 10230  
Tel: 02-576 4053-4 Fax: 02-575 2672 www.cali-lab.co.th E-mail: cali@cali-lab.co.th



Supplement to Calibration Certificate No. Q24127999

## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2601/721A3301  
SERIAL NO. : UM14546/UM14546 [UAE.EFM.030/2562]  
CLID, NO. : 252000247  
JOB CONTROL NO. : 241203127999  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 03 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Surwit Phuanbusabong

Approved By :

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. Q24127999A1

F3-012-05/12-23

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Supplement to Calibration Certificate No. Q24127999

## REPORT OF CALIBRATION FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2601/721A3301  
SERIAL NO. : UMI4546/UMI4546 [UAE.EFM.03@2562]  
DATE OF CALIBRATION : 04 December 2024

### ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.  
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 % .  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24127999A1  
F3-012-05/12-23

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เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

### CALIBRATION DATA

#### 1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( g )	( frequency )		( g )	( g )	( g )	± ( % of rdg. )
0.3	50 Hz	peak	0.300	0.305	-0.005	1.9
0.4	50 Hz		0.400	0.407	-0.007	1.6
0.5	50 Hz		0.500	0.508	-0.008	1.6
0.6	50 Hz		0.600	0.609	-0.009	2.5
0.7	50 Hz		0.700	0.710	-0.010	2.5
0.3	100 Hz	peak	0.300	0.304	-0.004	1.9
0.4	100 Hz		0.400	0.406	-0.006	1.6
0.5	100 Hz		0.500	0.508	-0.008	1.6
0.6	100 Hz		0.600	0.608	-0.008	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

#### 2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	± ( % of rdg. )
3	50 Hz	peak	3.000	3.047	-0.047	1.8
4	50 Hz		4.000	4.054	-0.054	1.8
5	50 Hz		5.000	5.066	-0.066	1.8
6	50 Hz		6.000	6.079	-0.079	1.8
7	50 Hz		7.000	7.097	-0.097	1.8
*3	100 Hz	peak	3.000	3.045	-0.045	1.6
*4	100 Hz		4.000	4.066	-0.066	1.6
*5	100 Hz		5.000	5.075	-0.075	1.6
*6	100 Hz		6.000	6.088	-0.088	1.5
*7	100 Hz		7.000	7.101	-0.101	1.5

Certificate No. Q24127999

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เอกสารไม่ควบคุม



### CALIBRATION DATA

#### 3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm )	( frequency )		( mm )	( mm )	( mm )	± ( % of rdg. )
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.060	0.000	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

\* means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

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

### End of Certificate ###

Certificate No. Q24127999  
F3-011-05/12-23

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เอกสารไม่ควบคุม



Supplement to Calibration Certificate No. Q24128001

## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2601/721A3301  
SERIAL NO. : UMI4466/UMI4466 [UAE.EFM.095/2562]  
CLID. NO. : 252000053  
JOB CONTROL NO. : 241203128001  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
81 SOI UDOMSIK 41, SUKHUMVIT ROAD,  
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 03 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer

Approved By :

29 January 2025

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

Certificate No. Q24128001A1

F3-012-05/12-23

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เอกสารไม่ควบคุม



Supplement to Calibration Certificate No. Q24128001

## REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2601/721A3301  
SERIAL NO. : UM14466/UM14466 [UAE.EFM.095/2562]  
DATE OF CALIBRATION : 04 December 2024

### ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.  
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Digital Multimeter, Keyight Technologies Model 3458A S/N. MY59352733.

### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AY-0030-24, Due Date 19 July 2025.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated in the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)".

Certificate No. Q24128001A1

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เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

### CALIBRATION DATA

#### 1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( g )	( frequency )		( g )	( g )	( g )	± ( % of rdg. )
0.3	50 Hz	peak	0.300	0.300	0.000	1.9
0.4	50 Hz		0.400	0.401	-0.001	1.6
0.5	50 Hz		0.500	0.503	-0.003	1.6
0.6	50 Hz		0.600	0.605	-0.005	2.5
0.7	50 Hz		0.700	0.707	-0.007	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.6
0.5	100 Hz		0.500	0.505	-0.005	1.6
0.6	100 Hz		0.600	0.605	-0.005	2.5
0.7	100 Hz		0.700	0.707	-0.007	2.5

#### 2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	± ( % of rdg. )
3	50 Hz	peak	3.000	3.011	-0.011	1.8
4	50 Hz		4.000	4.030	-0.030	1.8
5	50 Hz		5.000	5.044	-0.044	1.8
6	50 Hz		6.000	6.056	-0.056	1.8
7	50 Hz		7.000	7.079	-0.079	1.8
*3	100 Hz	peak	3.000	3.022	-0.022	1.6
*4	100 Hz		4.000	4.037	-0.037	1.6
*5	100 Hz		5.000	5.041	-0.041	1.6
*6	100 Hz		6.000	6.052	-0.052	1.5
*7	100 Hz		7.000	7.077	-0.077	1.5

Certificate No. Q24128001

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### CALIBRATION DATA

#### 3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm )	( frequency )		( mm )	( mm )	( mm )	± ( % of rdg. )
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

\* means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

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

### End of Certificate ###

Certificate No. Q24128001

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เอกสารไม่ควบคุม



Supplement to Calibration Certificate No. Q24128000

## CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2601/721A3301  
SERIAL NO. : UM14467/UM14467 [UAE.EFM.096/2562]  
CLID. NO. : 252000050  
JOB CONTROL NO. : 241203128000  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
81 SOI UDOMSUK 41, SUKHUNVIT ROAD,  
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 03 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer

Approved By :

29 January 2025

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. Q24128000A1

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เอกสารไม่ควบคุม







Supplement to Calibration Certificate No. Q24128000

## REPORT OF CALIBRATION

## FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2601/721A3301
SERIAL NO.	:	UM14467/UM14467 [UAE.EFM.096/2562]
DATE OF CALIBRATION	:	04 December 2024

## ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2) ^\circ\text{C}$  Relative Humidity :  $(55 \pm 15) \% \text{RH}$ 

## PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

## REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM007101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

## TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.

2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-005024, Due Date 13 May 2025.

3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)".

Certificate No. Q24128000A1

F3-012-05/12-23

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เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

## CALIBRATION DATA

## 1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( g )	( frequency )		( g )	( g )	( g )	$\pm$ ( % of rdg. )
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.402	-0.002	1.6
0.5	50 Hz		0.500	0.503	-0.003	1.6
0.6	50 Hz		0.600	0.603	-0.003	2.5
0.7	50 Hz		0.700	0.705	-0.005	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.402	-0.002	1.6
0.5	100 Hz		0.500	0.502	-0.002	1.6
0.6	100 Hz		0.600	0.603	-0.003	2.5
0.7	100 Hz		0.700	0.705	-0.005	2.5

## 2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	$\pm$ ( % of rdg. )
3	50 Hz	peak	3.000	3.015	-0.015	1.8
4	50 Hz		4.000	4.024	-0.024	1.8
5	50 Hz		5.000	5.034	-0.034	1.8
6	50 Hz		6.000	6.044	-0.044	1.8
7	50 Hz		7.000	7.058	-0.058	1.8
*3	100 Hz	peak	3.000	3.033	-0.033	1.6
*4	100 Hz		4.000	4.047	-0.047	1.6
*5	100 Hz		5.000	5.055	-0.055	1.6
*6	100 Hz		6.000	6.062	-0.062	1.5
*7	100 Hz		7.000	7.080	-0.080	1.5

Certificate No. Q24128000

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## CALIBRATION DATA

## 3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm )	( frequency )		( mm )	( mm )	( mm )	$\pm$ ( % of rdg. )
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.060	0.000	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.060	0.000	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67.

\* means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

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

### End of Certificate ###

Certificate No. Q24128000

F3-012-05/12-23

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เอกสารไม่ควบคุม



Supplement to Calibration Certificate No. Q24127998

## CERTIFICATE OF CALIBRATION

## FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2601/721A3301
SERIAL NO.	:	UM14472/UM14472 [UAE.EFM.101/2562]
CLID. NO.	:	252000710
JOB CONTROL NO.	:	241203127998
CALIBRATION SERVICE	:	<input checked="" type="checkbox"/> IN-LABORATORY <input type="checkbox"/> ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

81 SOI UDOMSIK 41, SUKHUMVIT ROAD,  
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 03 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer

Approved By :

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. Q24127998A1

F3-012-05/12-23

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เอกสารไม่ควบคุม





Supplement to Calibration Certificate No. Q24127998

## REPORT OF CALIBRATION

## FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : INSTANTEL  
MODEL / TYPE : 721A2601/721A3301  
SERIAL NO. : UM14472/UM14472 [UAE.EFM.101/2562]  
DATE OF CALIBRATION : 04 December 2024

## ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2) ^\circ\text{C}$  Relative Humidity :  $(55 \pm 15) \% \text{RH}$ 

## PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.  
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

## REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY9532533.

## TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95%.  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)".

Certificate No. Q24127998A1

F3-011-05/12-23

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เอกสารไม่ควบคุม



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

## CALIBRATION DATA

## 1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( g )	( frequency )		( g )	( g )	( g )	$\pm$ ( % of rdg. )
0.3	50 Hz	peak	0.300	0.303	-0.003	1.9
0.4	50 Hz		0.400	0.405	-0.005	1.6
0.5	50 Hz		0.500	0.506	-0.006	1.6
0.6	50 Hz		0.600	0.607	-0.007	2.5
0.7	50 Hz		0.700	0.708	-0.008	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.402	-0.002	1.6
0.5	100 Hz		0.500	0.503	-0.003	1.6
0.6	100 Hz		0.600	0.605	-0.005	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

## 2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	$\pm$ ( % of rdg. )
3	50 Hz	peak	3.000	3.035	-0.035	1.8
4	50 Hz		4.000	4.042	-0.042	1.8
5	50 Hz		5.000	5.059	-0.059	1.8
6	50 Hz		6.000	6.068	-0.068	1.8
7	50 Hz		7.000	7.086	-0.086	1.8
*3	100 Hz	peak	3.000	3.037	-0.037	1.6
*4	100 Hz		4.000	4.042	-0.042	1.6
*5	100 Hz		5.000	5.057	-0.057	1.6
*6	100 Hz		6.000	6.084	-0.084	1.5
*7	100 Hz		7.000	7.112	-0.112	1.5

Certificate No. Q24127998

F3-011-05/12-23

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## CALIBRATION DATA

## 3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm )	( frequency )		( mm )	( mm )	( mm )	$\pm$ ( % of rdg. )
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

\* means Calibrations marked " Not ANAB Accredited " in this Certificate have been included for completeness.

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

### End of Certificate ###

Certificate No. Q24127998

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## INNOVATIVE INSTRUMENT CALIBRATION LAB

## INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7/10 MOO 13, SOI SINTSARAKORN 11 TAMBON BANG KHAO,  
AMPHOE BANG PHUANG SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL: 0669-2116-7800-1 FAX: 0669-2116-7140

Page 1 of 2

## Certificate of Calibration

## Customer

Name : UNITED ANALYST AND ENGINEERING  
CONSULTANT CO., LTD.  
Address : 81 Soi Udornrak 41, Sukhumvit Road, Bangchak,  
Prakanong, Bangkok 10260

Certificate No : 25-ACT-074

Request No : Req-2025-1018

## Unit Under Calibration Details

Measurement item : Acoustic Calibrator  
Manufacturer : LARSON DAVIS  
Model : CAL200  
Serial Number : 21091  
ID : UAE.EFM.047/2566

Class : 1  
Range : 94 , 114 dB / 1000 Hz  
Instrument Status : Used

## Calibration Environment and Details

Temperature :  $( 23 \pm 2 ^\circ\text{C} )$   
Humidity :  $( 50 \pm 20 \% \text{RH} )$   
Barometric Pressure :  $( 1013 \pm 10.0 \text{ hPa} )$   
Received Date : 9 May 2025  
Calibration Date : 20 May 2025  
Location of Calibration : LAB 1 Acoustic  
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

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

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

## Note

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

Calibrated By :

Approved By :

Issue Date :

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

FM-708-ACT-02 Rev.04 Issue date 17/2/25



Certificate No : 25-ACT-074

Request No : Req-2025-1018

Calibration Results : Without Adjustment

Sound pressure level

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)
	Measured	Deviated value	Measured	Deviated value	
94 dB / 1000 Hz	93.90	-0.10	-	-	0.11
114 dB / 1000 Hz	113.86	-0.14	-	-	0.11

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)
	Measured (Hz)	Deviated value	Measured (Hz)	Deviated value	
94 dB / 1000 Hz	1000.0	0.00	-	-	0.01
114 dB / 1000 Hz	1000.0	0.00	-	-	0.010

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)
	Measured (%)	Deviated value	Measured (%)	Deviated value	
94 dB / 1000 Hz	1.89	-	-	-	0.17
114 dB / 1000 Hz	0.55	-	-	-	0.17

Note :

- The calibration results exclude the calibrator pressure correction

- The calibration results exclude the microphone volume correction

End of Calibration

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

FM-708-ACT-02 Rev 04 Issue date 12/12/25

Certificate No : 25-SLM-272

Request No : Req-2025-1706

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)	
FAST / A / 37-139						
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)
1000 Hz 114 dB	114.13	114.9	0.77	114.1	-0.03	0.20

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 36, SN. 107224

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	31.5	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	31.2	0.10
C	30.7	0.10
Z	35.1	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)
	A	C	Z	
FAST / 37-139				
STD Setting	(dB)	(dB)	(dB)	(± dB)
125 Hz	0.2	0.2	0.2	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	1.6	1.7	1.7	0.60
8000 Hz	2.3	2.3	2.3	0.70

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

FM-708-SLM-01 Rev 06 Issue date 17/2/25

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Certificate No : 25-SLM-272

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok

Request No : Req-2025-1706

10260

Unit Under Calibration Details

Measurement item : Sound Level Meter

Microphone Class : 2

Manufacturer : LARSON DAVIS

Microphone Model : 375B02

Model : LxT2

Microphone S/N : 011740

Serial Number : 0005286

Preamplifier Model : PRMLxT2B

ID : UAE-EFM-102/2562

Preamplifier S/N : 056087

Resolution : 0.1 dB

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C

Humidity : 50 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 22 July 2025

Calibrated Date : 11 August 2025

Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests

Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Multifunction Acoustic Calibrator	Brüel&Kjaer	4226	3412381	8 May 2026	NIMT
Audio Generator	SvanteK	Svan401	131	15 October 2025	WK Electric

Note

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

Calibrated By :

Approved By :

Issue Date :

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

FM-708-SLM-01 Rev 06 Issue date 17/2/25

Certificate No : 25-SLM-272

Request No : Req-2025-1706

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)
	A (dB)	C (dB)	Z (dB)	
FAST / 37-139				
STD Setting	(dB)	(dB)	(dB)	(± dB)
63 Hz	-0.2	0.0	0.0	0.20
125 Hz	-0.1	0.0	0.0	
250 Hz	-0.1	0.0	0.0	
500 Hz	-0.1	0.0	0.0	
1000 Hz	0.0	0.0	0.0	
2000 Hz	0.0	0.0	0.0	
4000 Hz	0.0	0.0	0.0	
8000 Hz	0.0	0.0	0.0	
16000 Hz	-0.1	-0.1	-0.1	

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	
FAST / 37-139				
UUC Weighting	(dB)	(dB)	(dB)	(± dB)
A	114.00	114.0	0.0	0.20
C	114.00	114.0	0.0	
Z	114.00	114.0	0.0	

UUC Setting	STD	Measured		UNCERTAINTY (± dB)
		UUC (dB)	ERR (dB)	
37-139 / A				
UUC Time Response	(dB)	(dB)	(dB)	(± dB)
Fast	114.00	114.0	0.0	0.20
Slow	114.00	114.0	0.0	
Leq	114.00	114.0	0.0	

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

FM-708-SLM-01 Rev 06 Issue date 17/2/25



Certificate No : 25-SLM-272  
Request No : Req-2025-1706

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Initial	114.0	
Final	114.0	
Deviated	0.0	0.10

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY
FAST / A / 37-139	REF	UUC	(± dB)
STD dB	(dB)	(dB)	
ERR	(dB)	(dB)	
ERR	(dB)	(dB)	
139.00	139	139.0	0.30
134.00	134	134.0	
129.00	129	129.0	
124.00	124	124.0	
119.00	119	119.0	
114.00	114	114.0	
109.00	109	109.0	
104.00	104	104.0	
99.00	99	99.0	
94.00	94	94.0	
89.00	89	89.0	
84.00	84	84.0	
79.00	79	79.0	
74.00	74	74.0	
69.00	69	69.0	
64.00	64	64.0	
59.00	59	59.0	
54.00	54	54.0	
49.00	49	49.1	
44.00	44	44.2	
41.00	41	41.5	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-SLM-01 Rev.06 Issue date: 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-272  
Request No : Req-2025-1706

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY
FAST / A	REF	UUC	(± dB)
ERR	(dB)	(dB)	
ERR	(dB)	(dB)	
ERR	(dB)	(dB)	
37-139	46.60	46.7	0.30
	114	114.0	

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY
A / 37-139	Toneburst	Ref	UUC	(± dB)
ERR	(ms)	(dB)	(dB)	
ERR	(ms)	(dB)	(dB)	
ERR	(ms)	(dB)	(dB)	
Fast	200	135.0	134.9	0.20
	2	118.0	117.8	
	0.25	109.0	108.5	
Slow	200	128.6	128.4	
	2	109.0	108.8	
	0.25	100.0	99.8	

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY
FAST / C / 95-142	REF	UUC	(± dB)
STD Setting	(dB)	(dB)	
ERR	(dB)	(dB)	
ERR	(dB)	(dB)	
Complete cycle	137.4	136.8	0.20
Positive half cycle	136.4	136.2	
Negative half cycle	136.4	136.2	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-SLM-01 Rev.06 Issue date: 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-272  
Request No : Req-2025-1706

12. Overload indication

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Positive one-half cycle	145.5	
Negative one-half cycle	145.6	
Deviated	-0.1	0.20

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Initial	138.0	
Final	138.0	
Deviated	0.0	0.10

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-SLM-01 Rev.06 Issue date: 17/2/25

เอกสารไม่ควบคุม

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Name : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok  
Address : 10260  
Certificate No : 25-SLM-241  
Request No : Req-2025-1240

Unit Under Calibration Details

Measurement item : Sound Level Meter  
Microphone Class : 2  
Manufacturer : LARSON DAVIS  
Microphone Model : 375A04  
Model : 1xT2  
Microphone S/N : 350427  
Serial Number : 0005287  
Preamplifier Model : PRMLsTZB  
ID : UAE.EFM.103/2562  
Preamplifier S/N : 056074  
Resolution : 0.1 dB  
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 16 July 2025  
Calibrated Date : 29 July 2025  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1 : 2013 Electroacoustics - Sound level meters - Part 1: Periodic tests  
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Multifunction Acoustic Calibrator	Brüel&Kjaer	4226	3412381	8 May 2026	NIMT
Audio Generator	Svante	Svan401	131	15 October 2025	WK Electric

Note

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

Calibrated By :

Approved By :

Issue Date :



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-SLM-01 Rev.06 Issue date: 17/2/25

เอกสารไม่ควบคุม

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.  
FM-708-SLM-01 Rev.06 Issue date: 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241

Request No : Req-2025-1240

#### 1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)
1000 Hz 114.0B	114.68	115.2	0.52	114.7	0.02	0.20

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model AC-300, SN: AC-300001087

#### 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.4	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.2	0.10
C	27.9	0.10
Z	34.6	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY
	A	C	Z	
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)
125 Hz	0.4	0.3	0.3	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	0.1	0.1	0.1	0.60
8000 Hz	-0.3	-0.3	-0.2	0.70

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

PM-708-SLM-01 Rev.06 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241

Request No : Req-2025-1240

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY
FAST / 37-139	A (dB)	C (dB)	Z (dB)	
STD Setting	(dB)	(dB)	(dB)	(± dB)
63 Hz	0.2	0.2	0.2	0.20
125 Hz	0.1	0.2	0.2	
250 Hz	0.0	0.1	0.1	
500 Hz	0.0	0.1	0.0	
1000 Hz	0.0	0.0	0.0	
2000 Hz	0.0	0.0	0.0	
4000 Hz	-0.1	-0.1	-0.1	
8000 Hz	-0.2	-0.2	-0.1	
16000 Hz	-0.2	-0.2	-0.3	

#### 6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY
FAST / 37-139	REF	UUC	ERR	
UUC Weighting	(dB)	(dB)	(dB)	(± dB)
A	114.00	114.0	0.0	0.20
C	114.00	114.0	0.0	
Z	114.00	114.0	0.0	

UUC Setting	STD	Measured		UNCERTAINTY
37-139 / A	REF	UUC	ERR	
UUC Time Response	(dB)	(dB)	(dB)	(± dB)
Fast	114.00	114.0	0.0	0.20
Slow	114.00	114.0	0.0	
Leq	114.00	114.0	0.0	

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

PM-708-SLM-01 Rev.06 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241

Request No : Req-2025-1240

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	
STD Setting	(dB)	(± dB)
Initial	114.0	
Final	114.0	
Deviated	0.0	0.10

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY
FAST / A / 37-139	REF	UUC	ERR	
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	0.30
134.00	134	134.0	0.0	
129.00	129	129.0	0.0	
124.00	124	124.0	0.0	
119.00	119	119.0	0.0	
114.00	114	114.0	0.0	
109.00	109	109.0	0.0	
104.00	104	104.0	0.0	
99.00	99	99.0	0.0	
94.00	94	93.9	-0.1	
89.00	89	88.9	-0.1	
84.00	84	83.9	-0.1	
79.00	79	78.9	-0.1	
74.00	74	73.9	-0.1	
69.00	69	68.9	-0.1	
64.00	64	63.9	-0.1	
59.00	59	58.9	-0.1	
54.00	54	54.0	0.0	
49.00	49	49.0	0.0	
44.00	44	44.0	0.0	
39.00	39	39.2	0.2	
34.00	34	34.3	0.3	
37.00	37	37.4	0.4	
36.00	36	36.5	0.5	

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

PM-708-SLM-01 Rev.06 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate No : 25-SLM-241

Request No : Req-2025-1240

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY
FAST / A	REF	UUC	ERR	
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	42.00	42.1	0.1	0.30
	114	114.0	0.0	

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY
A / 37-139	Toneburst	Ref	UUC	ERR	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	134.9	-0.1	0.20
	2	118.0	117.9	-0.1	
	0.25	109.0	108.7	-0.3	
Slow	200	128.6	128.4	-0.2	
	2	109.0	108.8	-0.2	
	200	129.0	129.0	0.0	
SEL	2	109.0	109.1	+0.1	
	0.25	100.0	99.9	-0.1	

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY
FAST / C / 95-142	REF	UUC	ERR	
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	136.8	-0.60	0.20
Positive half cycle	136.4	136.2	-0.20	
Negative half cycle	136.4	136.2	-0.20	

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

PM-708-SLM-01 Rev.06 Issue date 17/2/25

เอกสารไม่ควบคุม



Certificate No : 25-SLM-241  
Request No : Req-2025-1240

12. Overload indication

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Positive one-half cycle	140.8	
Negative one-half cycle	140.6	
Deviated	0.2	0.20

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Initial	138.0	
Final	138.0	
Deviated	0.0	0.10

End of Certificate

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

PM-308-SLM-01 Rev.06 Issue date 17/2/25

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 25-SLM-242  
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok Request No : Req-2025-1241  
10260

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2  
Manufacturer : LARSON DAVIS Microphone Model : 375B02  
Model : LxT2 Microphone S/N : 011731  
Serial Number : 0005288 Preamplifier Model : PRMLxT2B  
ID : UAE.EFM.104/2562 Preamplifier S/N : 056075  
Resolution : 0.1 dB Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 16 July 2025  
Calibrated Date : 29 July 2025  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Multifunction Acoustic Calibrator	Briel&Kjaer	4226	3412381	8 May 2026	NIMT
Audio Generator	Svantek	Svan401	131	15 October 2025	WK Electric

Note

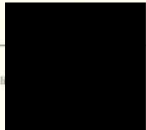
The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.

Calibrated By :



Ser

Approved By :



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Issue Date :

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PM-308-SLM-01 Rev.06 Issue date 17/2/25

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Certificate No : 25-SLM-242  
Request No : Req-2025-1241

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	(± dB)
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	
1000 Hz 114 dB	114.68	115.2	0.52	114.7	0.02	

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model AC-300, SN. AC-300001087

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	30.8	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	30.6	0.10
C	30.2	0.10
Z	34.3	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY
FAST / 37-139	A	C	Z	(± dB)
STD Setting	(dB)	(dB)	(dB)	
125 Hz	0.1	0.1	0.1	
1000 Hz	0.0	0.0	0.0	
4000 Hz	1.6	1.6	1.6	0.60
8000 Hz	2.2	2.2	2.3	0.70

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Certificate No : 25-SLM-242  
Request No : Req-2025-1241

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY
FAST / 37-139	A (dB)	C (dB)	Z (dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	
63 Hz	-0.1	0.0	0.0	
125 Hz	-0.1	0.1	0.0	
250 Hz	-0.1	0.0	0.0	
500 Hz	0.0	0.1	0.0	
1000 Hz	0.0	0.0	0.0	
2000 Hz	0.1	0.1	0.0	
4000 Hz	0.0	0.1	0.1	
8000 Hz	0.0	0.0	0.1	
16000 Hz	0.0	0.0	-0.1	

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY
FAST / 37-139	REF	UUC	ERR	(± dB)
UUC Weighting	(dB)	(dB)	(dB)	
A	114.00	114.0	0.0	
C	114.00	114.0	0.0	
Z	114.00	114.0	0.0	0.20

UUC Setting	STD	Measured		UNCERTAINTY
37-139 / A	REF	UUC	ERR	(± dB)
UUC Time Response	(dB)	(dB)	(dB)	
Fast	114.00	114.0	0.0	
Slow	114.00	114.0	0.0	
Leq	114.00	114.0	0.0	0.20

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Certificate No : 25-SLM-242  
Request No : Req-2025-1241

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Initial	114.0	
Final	114.0	
Deviated	0.0	0.10

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY
FAST / A / 37-139	REF	UUC	(± dB)
STD dB	(dB)	(dB)	
139.00	139	139.0	
134.00	134	134.0	
129.00	129	129.0	0.30
124.00	124	124.0	
119.00	119	119.0	
114.00	114	114.0	
109.00	109	109.0	
104.00	104	104.0	
99.00	99	99.0	
94.00	94	94.0	
89.00	89	89.0	
84.00	84	84.0	
79.00	79	79.0	
74.00	74	74.0	
69.00	69	69.0	
64.00	64	64.0	
59.00	59	59.0	
54.00	54	54.1	
49.00	49	49.1	
44.00	44	44.2	
40.00	40	40.5	

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PM-708-SLM-01 Rev.06 Issue date 17/2/25

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Certificate No : 25-SLM-242  
Request No : Req-2025-1241

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY
FAST / A	REF	UUC	(± dB)
UUC Range	(dB)	(dB)	
37-139	45.20	45.4	
	114	114.0	

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY
A / 37-139	Toneburst	Ref	UUC	(± dB)
UUC Time Response	(ms)	(dB)	(dB)	
Fast	200	135.0	134.9	
	2	118.0	117.8	
Slow	0.25	109.0	108.7	0.20
	200	128.6	128.4	
	2	109.0	108.8	
SEL	200	129.0	129.0	
	2	109.0	108.9	-0.1
	0.25	100.0	99.8	

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY
FAST / C / 95-142	REF	UUC	(± dB)
STD Setting	(dB)	(dB)	
Complete cycle	137.4	136.7	
Positive half cycle	136.4	136.1	
Negative half cycle	136.4	136.1	-0.30

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Certificate No : 25-SLM-242  
Request No : Req-2025-1241

#### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Positive one-half cycle	142.5	
Negative one-half cycle	142.4	
Deviated	0.1	0.20

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 37-139	UUC	(± dB)
STD Setting	(dB)	
Initial	138.0	
Final	138.0	
Deviated	0.0	0.10

End of Certificate

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

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Tel: +66 2709 4860 Fax: +66 2324 0917

Certificate No.: CP20240341EA  
Operation No.: CP2024090312

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT2 (Meter), 375802 (Microphone), PRLxT2B (Preamplifier)

Serial No.: 0005298 (Meter), 011741 (Microphone), 056088 (Preamplifier)

ID No.: UAE.EFM.113/2562

Customer: United Analyst and Engineering Consultant Co.,Ltd.

Address: 81 Sol Udomsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260

Received Date: 3 September 2024

Calibrated Date: 23 - 25 September 2024

Issued Date: 26 September 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: (Mr. S. [Signature])

This report was prepared electronically using applicable electronic signature. Printing or copy of the are considered as a copy of the document.  
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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Certificate No.: CP20240341EA

## Calibration Report

Equipment: Sound Level Meter  
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)  
Model/Type: LxT2 (Meter), 375802 (Microphone), PRLxT2B (Preamplifier)  
Serial No.: 0005298 (Meter), 011741 (Microphone), 056088 (Preamplifier)  
ID No.: UAC.EFM.113/2562  
Ambient Temperature: (23 ± 2) °C  
Relative Humidity: (50 ± 15) %  
Pressure: (101.3 ± 1.5) kPa  
Method of Calibration :-  
IEC 61672-3:2013.

## Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P240022	20 March 2025
			CD20240180EA	7 August 2025
6) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB	13 February 2025
			CK20240069EA	19 September 2025

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

## Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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F-CAL-005 Ed.1

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Certificate No.: CP20240341EA

## Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
31.1

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	31.1
C-weighting	31.0
Z-weighting	36.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	0.1	0.1	±1.5
1000	0.3	0.3	0.3	±1.0
8000	1.3	1.2	1.3	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	0.0	±1.5
500	0.1	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

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เอกสารไม่ควบคุม

Certificate No.: CP20240341EA

## Calibration Report

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAEq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
134.0	134.1	0.1	±1.1
139.0	139.1	0.1	±1.1
140.0	140.1	0.1	±1.1
141.0	141.1	0.1	±1.1
142.0	142.1	0.1	±1.1
143.0	143.1	0.1	±1.1

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Certificate No.: CP20240341EA

## Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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	44.2	0.2	±1.1
43.0	43.3	0.3	±1.1
42.0	42.4	0.4	±1.1
41.0	41.5	0.5	±1.1
40.0	40.5	0.5	±1.1

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±1.0
	2	118.9	-0.1	+1.0; -2.5
	0.25	109.8	-0.2	+1.5; -5.0
Slow	200	129.5	-0.1	±1.0
	2	109.9	-0.1	+1.0; -5.0
	0.25	110.0	0.0	+1.0; -2.5
LAE	200	130.0	0.0	±1.0
	2	101.0	0.0	+1.5; -5.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±3.0
Positive half cycle	134.4	134.1	-0.3	±2.0
Negative half cycle	134.4	134.2	-0.2	±2.0

Function : 10. Overload Indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
145.0	145.2	0.2	±1.5

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Certificate No.: CP20240341EA

## Calibration Report

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	$\pm 0.3$

## Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.24	0.25
11) High-Level Stability	0.10	0.10

Remarks:

1. The acceptance limit is for the deviated value.
2. Acceptance limits was IEC61672-3:2013 Class 2.
3. The coverage factor  $k = 2.00$

-- End of Report --