

ภาคผนวก จ
เอกสารสอบเทียบเครื่องมือวัด

CERTIFICATE OF CALIBRATION

Certificate No. : CO-004-66

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : Andersen Instruments
MODEL/TYPE : G25A
SERIAL NUMBER : 1270
ID NUMBER : UAE.ANV.009/2542
CONDITION AS-RECEIVED : Used item
CUSTOMER : United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 02 Jun 2023
MEASUREMENT DATE : 12 Jun 2023
ISSUE DATE : 12 Jun 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.3 °C and 55.0%RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/W2-dp. The WI-GL-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 VSL (National Metrology Institute of Netherlands) via Certificate number: G2211901

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 Orifice 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 ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_meter mmHg	Δp_Orifice inH ₂ O	γ	Standard Flow [Q _s] m ³ /min
1	0.705	755.787	24.17	23.48	47.401	1.708	1.305	0.661
2	0.999	755.849	23.95	23.54	51.522	3.383	1.837	0.930
3	1.119	755.810	23.39	22.98	35.502	4.448	2.109	1.068
4	1.170	755.752	23.42	23.02	26.462	4.999	2.235	1.131
5	1.425	755.681	23.52	23.12	26.582	7.431	2.725	1.376

Slope (m): 1.98581
Intercept (b): -0.00879
Correlation coefficient (r): 0.99984
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_meter mmHg	Δp_Orifice inH ₂ O	γ	Standard Flow [Q _s] m ³ /min
1	0.705	755.787	24.17	23.48	47.401	1.708	0.820	0.663
2	0.999	755.849	23.95	23.54	51.522	3.383	1.153	0.932
3	1.119	755.810	23.39	22.98	35.502	4.448	1.321	1.068
4	1.170	755.752	23.42	23.02	26.462	4.999	1.401	1.131
5	1.425	755.681	23.52	23.12	26.582	7.431	1.708	1.377

Slope (m): 1.24382
Intercept (b): -0.00554
Correlation coefficient (r): 0.99984
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



Calibrated by:
☐ Mr. Spravit Thachalad
☒ Miss Jitraporn Lertsomphol

Approved by: [Signature]
Calibration Department Manager

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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 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No. : 23P1401
Page : 1 of 2

Equipment : U-Tube Manometer
Manufacturer: Dwyer
Model : 1221-36-W/M
Serial No.: -
ID No.: UAE.EFM.022/2560

Condition As-Received: Used Item
Received Date: 26 April 2023
Calibration Date: 09 May 2023

Reference: 2304-0703WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1010 mbar

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

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

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges, Edition 03/2014 " 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-0137-22	24 Aug 2023

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

3.Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

4.This instrument was used clean air and oil 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 (NIMT)

Calibrated by : Suwit Aussarree
Issue Date : 11 May 2023

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B 0314241



Cert.No.: 23P1401
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Pressure Measurement

Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Fifth Estimate)

UUC Indication			ΔP (inH ₂ O)	Error (inH ₂ O)
Applied Pressure (inH ₂ O)	High-port side (inH ₂ O)	Low-port side (inH ₂ O)		
0.00	0.00	0.00	0.00	0.00
2.00	1.00	0.98	1.98	-0.02
4.00	2.00	1.98	3.98	-0.02
6.00	3.00	2.98	5.98	-0.02
8.00	4.00	3.98	7.98	-0.02
10.00	5.00	4.98	9.98	-0.02
12.00	6.00	6.00	12.00	0.00
14.00	7.00	7.00	14.00	0.00
16.00	8.00	8.00	16.00	0.00
18.00	9.00	9.00	18.00	0.00
20.00	10.00	10.00	20.00	0.00
22.00	11.00	11.00	22.00	0.00
24.00	12.02	12.00	24.02	0.02
26.00	13.02	13.00	26.02	0.02
28.00	14.02	14.00	28.02	0.02
30.00	15.04	15.00	30.04	0.04
32.00	16.04	16.00	32.04	0.04
34.00	17.02	17.00	34.02	0.02
35.80	18.00	17.96	35.96	0.16

The uncertainty of measurement was ± 0.11 inH₂O

* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side

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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Attapol P.

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Certificate of Calibration

Certificate No. : 23P1856
Page : 1 of 2

Equipment : Aneroid Barometer
Manufacturer : Barigo
Model : -
Serial No. : -
ID No. : UAE.EMA2.110/2555

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Corporate Services 3: Equipment Calibration and Testing Services.

Condition As-Received: Used Item
Received Date: 26 May 2023
Calibration Date: 02 June 2023

Reference: 2305-0919WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1006 mbar

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

81 Soi Udornsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to in-house calibration procedure CP-P10, using * DKD-R 6-1 ; Calibration of Pressure
Gauges, Edition 03/2014 " 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-0094-23	03 May 2024

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 : Suksan Khankaew
Issue Date : 08 June 2023

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B 0316956



Cert.No.: 23P1856
Page: 2 of 2

Result of calibration:- Without adjustment

Range: 720 mmHg to 800 mmHg

Function:- Absolute Pressure Measurement

Scale Interval: 1 mmHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (mmHg)	720.43	730.67	740.34	751.52	756.56	761.83	773.53	798.76
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	755.0	760.0	770.0	790.0
Error (mmHg)	-0.43	-0.67	-0.34	-1.52	-1.56	-1.83	-3.53	-8.76

Decreasing Pressure

Applied Pressure (mmHg)	798.76	773.60	761.89	756.65	751.59	740.72	730.68	720.59
UUC* Indication (mmHg)	790.0	770.0	760.0	755.0	750.0	740.0	730.0	720.0
Error (mmHg)	-8.76	-3.60	-1.89	-1.65	-1.59	-0.72	-0.68	-0.59

The uncertainty of measurement was ± 0.24 mmHg

* 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. : 23H1201
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer : Barigo
Model : -
Serial No. : -
ID No. : UAE.EMA2.014/2555

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Corporate Services 3: Equipment Calibration and Testing Services.

Condition As-Received: Used Item
Received Date: 26 May 2023
Calibration Date: 30 May 2023
to 06 June 2023

Reference: 2305-0919WSC
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

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

81 Soi Udornsuk 41, Sukhumvit Road,
Bangchak, 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) Hygro-M2 Dew Point Monitor	5112	2360195	20703	02 Aug 2023
2) Handheld Thermometer With Sensor	1523	3240076	231305	15 Mar 2024

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 Standards and Technology (NIST) , The United States of America

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

Calibrated by : Somchai Dumwor
Issue Date : 07 June 2023

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B 0316275



Cert.No.: 23H1201
Page: 2 of 2

Result of Calibration:-

Before Adjustment

Function: Humidity Measurement

Reference Temperature	Standard Humidity	UUC* Reading	Error	Uncertainty of Measurement
(°C)	(%R.H.)	(%R.H.)	(%R.H.)	(±%R.H.)
25.0	40.1	55	14.9	1.6
25.0	60.0	66	6.0	1.7
25.0	80.0	78	-2.0	1.9

Result of Calibration:-

After Adjustment

Function: Humidity Measurement

Reference Temperature	Standard Humidity	UUC* Reading	Error	Uncertainty of Measurement
(°C)	(%R.H.)	(%R.H.)	(%R.H.)	(±%R.H.)
25.0	40.1	46	5.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	72	-8.0	1.9

Result of Calibration:-

Without Adjustment

Function: Temperature Measurement

Standard Temperature	UUC* Reading	Error	Uncertainty of Measurement
(°C)	(°C)	(°C)	(±°C)
19.987	20.0	0.013	0.72
30.016	30.0	-0.016	0.72
39.944	39.0	-0.944	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

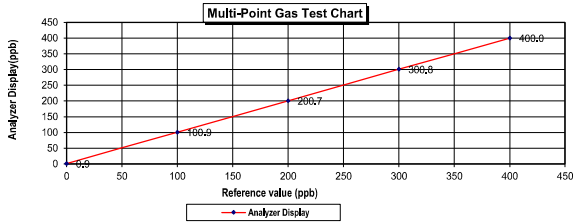
Test Date : Nov 7, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM22387039

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.90	0.90	0.90
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.48



MULTI-POINT GAS TEST REPORT

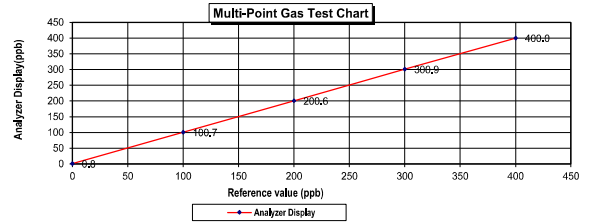
Test Date : Nov 7, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM22387040

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.80	0.80	0.80
Level 2	20,00%	100.0	100.7	0.70	0.70	0.70
Level 3	40,00%	200.0	200.6	0.60	0.30	0.30
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 (%)		0.42



MULTI-POINT GAS TEST REPORT

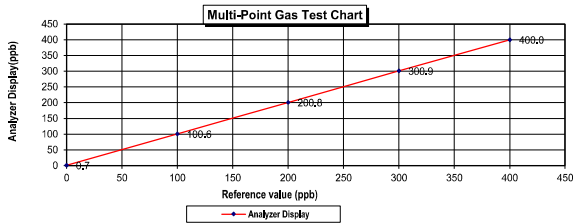
Test Date : Nov 1, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1201778105

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.70	0.70	0.70
Level 2	20.00%	100.0	0.60	0.60	0.60
Level 3	40.00%	200.0	0.80	0.40	0.40
Level 4	60.00%	300.0	0.90	0.30	0.30
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.40



MULTI-POINT GAS TEST REPORT

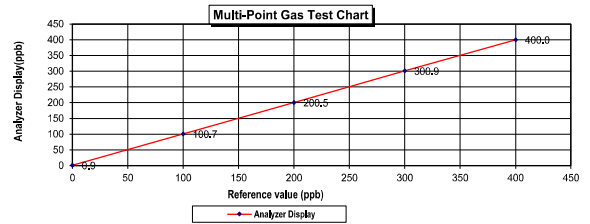
Test Date : Nov 1, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1200636463

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.90	0.90	0.90
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
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 (%)		0.43



CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E04NI99E15A01D3 Reference Number: 122-402135167-1
Cylinder Number: EB0143262 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2015 PSIG
PGVP Number: B22021 Valve Outlet: 680
Gas Code: CO,NO,NOX,SO₂,BALN Certification Date: Jun 21, 2021

Expiration Date: Jun 21, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800R-12/831, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	45.96 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 09/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 09/21/2021
SULFUR DIOXIDE	45.00 PPM	44.98 PPM	G1	+/- 1.0% NIST Traceable	08/14/2021, 09/21/2021
CARBON MONOXIDE	1000 PPM	984.8 PPM	G1	+/- 0.7% NIST Traceable	08/14/2021
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	20051120	CC708098	49.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Feb 02, 2025
PRM	12386	D585025	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 20, 2020
GMIS	401423838102	CC505581	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1	Feb 18, 2023
NTRM	16011043	CC473277	46.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 17, 2022
NTRM	14601119	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	+/-0.8%	Nov 15, 2025

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

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801333 CO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO ₂	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 SO ₂	FTIR	Jun 03, 2021

Triad Data Available Upon Request

NOTES: PO #5221002807

GROSS WT: 28.40kg

NET WT: 4.73kg



The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.



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MULTI-POINT GAS TEST REPORT

Test Date : Nov 3, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387065

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.68 PPM
Nitric Oxide (NO) 45.94 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 984.8 PPM
Cylinder No. : EB0143262
Expiration Date : Jun 24, 2024

Dilutor Detail

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

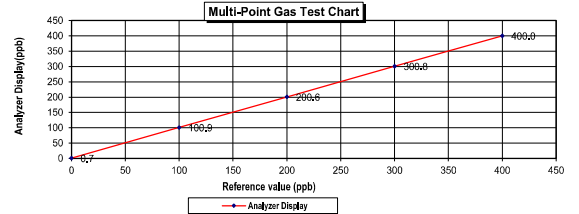
Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70
Level 2	20,00%	100.0	100.9	0.90	0.89
Level 3	40,00%	200.0	200.6	0.60	0.30
Level 4	60,00%	300.0	300.8	0.80	0.27
Level 5	80,00%	400.0	400.0	0.00	0.00

Remark : Measuring Range 500.0 ppb

:Acceptable Limit \pm 5%

Average Difference (%) 0.43



MULTI-POINT GAS TEST REPORT

Test Date : Nov 3, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387066

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.68 PPM
Nitric Oxide (NO) 45.94 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 984.8 PPM
Cylinder No. : EB0143262
Expiration Date : Jun 24, 2024

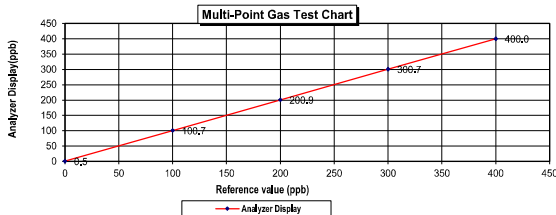
Dilutor Detail

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

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.5	0.50	0.50
Level 2	20,00%	100.0	100.7	0.70	0.70
Level 3	40,00%	200.0	200.9	0.90	0.45
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

:Acceptable Limit \pm 5%

MULTI-POINT GAS TEST REPORT

Test Date : Nov 3, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1200906875

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.68 PPM
Nitric Oxide (NO) 45.94 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 984.8 PPM
Cylinder No. : EB0143262
Expiration Date : Jun 24, 2024

Dilutor Detail

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

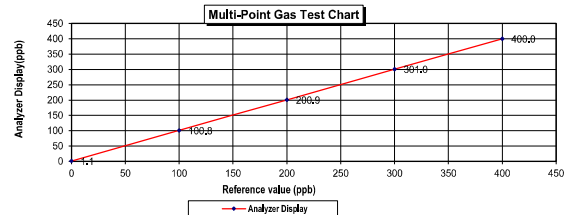
Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.1	1.10	1.10
Level 2	20,00%	100.0	100.8	0.80	0.79
Level 3	40,00%	200.0	200.9	0.90	0.45
Level 4	60,00%	300.0	301.0	1.00	0.33
Level 5	80,00%	400.0	400.0	0.00	0.00

Remark : Measuring Range 500.0 ppb

:Acceptable Limit \pm 5%

Average Difference (%) 0.53





MULTI-POINT GAS TEST REPORT

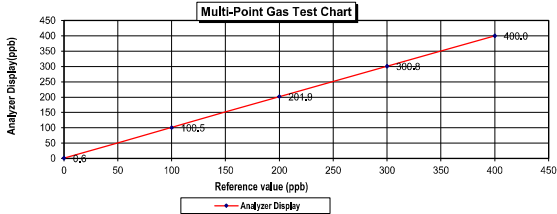
Test Date : Nov 9, 2023

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1200906876

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68 PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.94 PPM	Model :	146i
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8		
Cylinder No. :	EB0143262		
Expiration Date :	Jun 24, 2024		

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.6	0.60	0.60
Level 2	20.00%	100.0	100.5	0.50	0.50
Level 3	40.00%	200.0	201.9	1.90	0.94
Level 4	60.00%	300.0	300.8	0.80	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.46
:Acceptable Limit \pm 5%					



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CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: E04NI99E15A01D3 Reference Number: 122-402135167-1
Cylinder Number: EB0143262 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2015 PSIG
PGVP Number: B22021 Valve Outlet: 680
Gas Code: CO,NO,NOX,SO₂,BALN Certification Date: Jun 21, 2021

Expiration Date: Jun 21, 2024

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 mol/mole basis unless otherwise noted.
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	45.00 PPM	45.96 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 09/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 09/21/2021
SULFUR DIOXIDE	45.00 PPM	44.98 PPM	G1	+/- 1.0% NIST Traceable	08/14/2021, 09/21/2021
CARBON MONOXIDE	1000 PPM	984.8 PPM	G1	+/- 0.7% NIST Traceable	08/14/2021
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	20061120	CC708068	49.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Feb 02, 2025
PRM	12386	D885025	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 20, 2020
GMIS	401423838102	CC505581	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1	Feb 18, 2023
NTRM	16011043	CC473277	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 17, 2022
NTRM	14060119	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Nov 15, 2025
The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.					

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801333 CO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO ₂	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 SO ₂	FTIR	Jun 03, 2021

Triad Data Available Upon Request

NOTES: PO #5221002807

GROSS WT: 28.40kg

NET WT: 4.73kg



The the relate only to the test report.



เอกสารไม่ควบคุม



MULTI-POINT GAS TEST REPORT

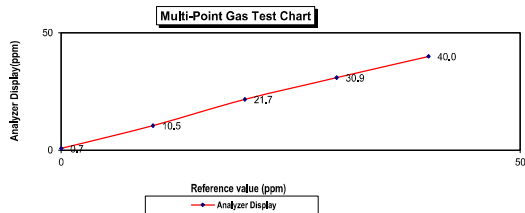
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1200636467

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94 PPM	Model :	146i
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8		
Cylinder No. :	EB0143262		
Expiration Date :	Jun 20, 2024		

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.7	0.7
Level 2	20.00%	10.0	10.5	0.5	4.8
Level 3	40.00%	20.0	21.7	1.7	7.8
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 (%)		3.24
:Acceptable Limit \pm 5%					



เอกสารไม่ควบคุม



MULTI-POINT GAS TEST REPORT

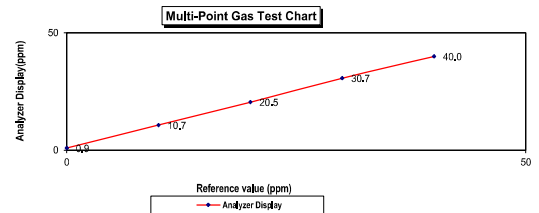
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1200906880

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94 PPM	Model :	146i
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8		
Cylinder No. :	EB0143262		
Expiration Date :	Jun 20, 2024		

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.9	0.9
Level 2	20.00%	10.0	10.7	0.7	6.5
Level 3	40.00%	20.0	20.5	0.5	2.4
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		Average Difference (%)		2.43
:Acceptable Limit \pm 5%					



เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Nov 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-69160-362

Standard Gas Concentration

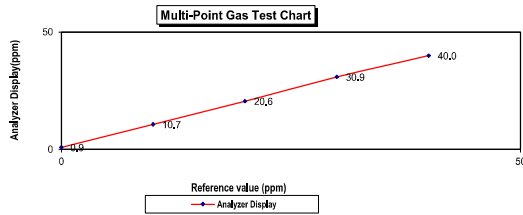
Sulphur Dioxide (SO₂) 44.68 PPM
Nitric Oxide (NO) 45.94 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 984.8 PPM
Cylinder No. : EB0143262
Expiration Date : Jun 20, 2024

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.9	0.9
Level 2	20.00%	10.0	0.7	6.5	6.5
Level 3	40.00%	20.0	0.6	2.9	2.9
Level 4	60.00%	30.0	0.9	2.9	2.9
Level 5	80.00%	40.0	0.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)	2.65	
:Acceptable Limit \pm 5%					



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เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Nov 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-73881-375

Standard Gas Concentration

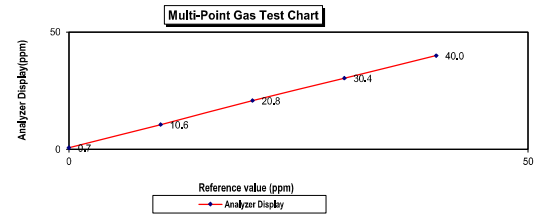
Sulphur Dioxide (SO₂) 44.68 PPM
Nitric Oxide (NO) 45.94 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 984.8 PPM
Cylinder No. : EB0143262
Expiration Date : Jun 20, 2024

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.7	0.7
Level 2	20.00%	10.0	0.6	5.7	5.7
Level 3	40.00%	20.0	0.8	3.8	3.8
Level 4	60.00%	30.0	0.4	1.3	1.3
Level 5	80.00%	40.0	0.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)	2.30	
:Acceptable Limit \pm 5%					



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เอกสารไม่ควบคุม



Airgas Specialty Gases
Airgas USA, LLC
630 United Drive
Durham, NC 27713
Airgas.com

CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: E04NI9BE15A01D3 Reference Number: 122-402135167-1
Cylinder Number: EB0143262 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2015 PSIG
PGVP Number: B22021 Valve Outlet: 680
Gas Code: CO,NO,NOX,SO₂,BALN Certification Date: Jun 21, 2021
Expiration Date: Jun 21, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/831, 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 molar basis unless otherwise noted.
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	45.00 PPM	45.96 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 08/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 08/21/2021
SULFUR DIOXIDE	45.00 PPM	44.86 PPM	G1	+/- 1.0% NIST Traceable	08/14/2021, 08/21/2021
CARBON MONOXIDE	1000 PPM	984.6 PPM	G1	+/- 0.7% NIST Traceable	08/14/2021
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	20081120	CC708068	49.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Feb 02, 2025
PRM	12386	D685025	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 20, 2020
GMIS	401423838102	CC505581	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1	Feb 18, 2023
NTRM	16011043	CC473277	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 17, 2022
NTRM	14080119	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Nov 15, 2025

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801333 CO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO ₂	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 SO ₂	FTIR	Jun 03, 2021

Triad Data Available Upon Request

NOTES: PO #5221002807
GROSS WT: 28.40kg
NET WT: 4.73kg



The analytical test results relate only to the cylinder and not to the test report.



CERT 3082.01

เอกสารไม่ควบคุม



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



CERTIFICATE OF CALIBRATION

FOR

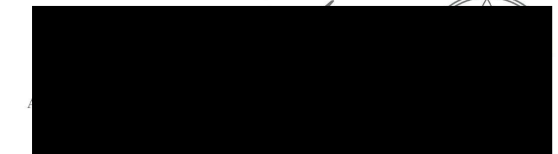
NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A3301
SERIAL NO. : UM11230/UM11230
CLID. NO. : 251701315
JOB CONTROL NO. : 231019117018

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

DATE OF RECEIVED : 19 October 2023 DATE OF ISSUED : 25 October 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



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. Q23117018
F3-011-04/01-12

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เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A3301
SERIAL NO. : UM11230/UM11230
DATE OF CALIBRATION : 20 October 2023

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 and Vibration Calibrator Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Digital Multimeter, Hewlett Packard Model 34401A S/N. 3146A75935.
3. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-23, Due Date 26 June 2024.
2. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0136-22, Due Date 11 November 2023.
3. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0043/23, Due Date 12 April 2024.

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. Q23117018

F3-011-04/01-12

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เอกสารไม่ควบคุม

CONDITION OF CALIBRATION ITEM : GOOD

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	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.402	-0.002	1.9
0.5	50 Hz		0.500	0.503	-0.003	1.9
0.6	50 Hz		0.600	0.603	-0.003	1.9
0.7	50 Hz		0.700	0.704	-0.004	1.9
0.3	100 Hz	peak	0.300	0.303	-0.003	1.9
0.4	100 Hz		0.400	0.404	-0.004	1.9
0.5	100 Hz		0.500	0.504	-0.004	1.9
0.6	100 Hz		0.600	0.605	-0.005	1.9
0.7	100 Hz		0.700	0.706	-0.006	1.9

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	3.033	-0.033	1.9
4	50 Hz		4.000	4.045	-0.045	1.9
5	50 Hz		5.000	5.057	-0.057	1.9
6	50 Hz		6.000	6.066	-0.066	1.9
7	50 Hz		7.000	7.081	-0.081	1.9
3	100 Hz	peak	3.000	3.039	-0.039	1.9
4	100 Hz		4.000	4.046	-0.046	1.9
5	100 Hz		5.000	5.055	-0.055	1.9
6	100 Hz		6.000	6.067	-0.067	1.9
7	100 Hz		7.000	7.079	-0.079	1.9

Certificate No. Q23117018

F3-011-04/01-12

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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	2.7
0.04	50 Hz		0.040	0.040	0.000	2.4
0.05	50 Hz		0.050	0.050	0.000	2.2
0.06	50 Hz		0.060	0.060	0.000	2.1
0.07	50 Hz		0.070	0.071	-0.001	2.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.7
0.04	100 Hz		0.040	0.040	0.000	2.4
0.05	100 Hz		0.050	0.050	0.000	2.2
0.06	100 Hz		0.060	0.061	-0.001	2.1
0.07	100 Hz		0.070	0.071	-0.001	2.1

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 009 Page 1,2 of 59

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

End of Certificate

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12865/UM12865
CLID. NO. : 251801712
JOB CONTROL NO. : 230914102597

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

DATE OF RECEIVED : 14 September 2023

DATE OF ISSUED : 19 September 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

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. Q23102597

F3-011-04/01-12

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เอกสารไม่ควบคุม

Certificate No. Q23117018

F3-011-04/01-12

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เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co.,LTD.

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



CALIBRATION LABORATORY Co.,LTD.

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



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12865/UM12865
DATE OF CALIBRATION : 15 September 2023

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, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
2. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
3. Accelerometer with Conditioning Amplifier, Bruel & Kjaer Model 8305, 2626 S/N. 705491, 1741406.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0043/23, Due Date 03 April 2024.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. EE-00010-23, Due Date 27 March 2024.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0025-22, Due Date 12 October 2023.

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. Q23102597

F3-011-04/01-12

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เอกสารไม่ควบคุม



@clccalibration

CONDITION OF CALIBRATION ITEM : GOOD

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	0.301	-0.001	1.9
0.4	50 Hz		0.400	0.403	-0.003	1.9
0.5	50 Hz		0.500	0.505	-0.005	1.3
0.6	50 Hz		0.600	0.606	-0.006	1.3
0.7	50 Hz		0.700	0.708	-0.008	1.3
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.9
0.5	100 Hz		0.500	0.505	-0.005	1.3
0.6	100 Hz		0.600	0.607	-0.007	1.3
0.7	100 Hz		0.700	0.712	-0.012	1.3

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	3.025	-0.025	1.8
4	50 Hz		4.000	4.033	-0.033	1.8
5	50 Hz		5.000	5.054	-0.054	1.8
6	50 Hz		6.000	6.067	-0.067	1.8
7	50 Hz		7.000	7.087	-0.087	1.8
3	100 Hz	peak	3.000	3.029	-0.029	1.8
4	100 Hz		4.000	4.036	-0.036	1.8
5	100 Hz		5.000	5.046	-0.046	1.8
6	100 Hz		6.000	6.072	-0.072	1.8
7	100 Hz		7.000	7.093	-0.093	1.8

Certificate No. Q23102597

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



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	2.1
*0.04	50 Hz		0.040	0.040	0.000	1.7
*0.05	50 Hz		0.050	0.051	-0.001	1.5
*0.06	50 Hz		0.060	0.061	-0.001	1.3
*0.07	50 Hz		0.070	0.071	-0.001	1.2
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.5
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.2

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

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 58

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

End of Certificate

Certificate No. Q23102597

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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12866/UM12866
CLID. NO. : 251801710
JOB CONTROL NO. : 231106122679

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

DATE OF RECEIVED : 06 November 2023

DATE OF ISSUED : 09 November 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

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. Q23122679

F3-011-04/01-12

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เอกสารไม่ควบคุม



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CALIBRATION LABORATORY Co.,LTD.

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CALIBRATION LABORATORY Co.,LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12866/UM12866
DATE OF CALIBRATION : 07 November 2023

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 and Vibration Calibrator Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Vibration Calibrator, The Modal Shop Model 91 10D S/N. 11424.
- Digital Multimeter, Hewlett Packard Model 34401A S/N. 3146A75935.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-23, Due Date 26 June 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0136-22, Due Date 11 November 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0043/23, Due Date 12 April 2024.

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. Q23122679

F3-011-04/01-12

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CONDITION OF CALIBRATION ITEM : GOOD

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	0.304	-0.004	1.9
0.4	50 Hz		0.400	0.406	-0.006	1.9
0.5	50 Hz		0.500	0.509	-0.009	1.9
0.6	50 Hz		0.600	0.610	-0.010	1.9
0.7	50 Hz		0.700	0.712	-0.012	1.9
0.3	100 Hz	peak	0.300	0.303	-0.003	1.9
0.4	100 Hz		0.400	0.406	-0.006	1.9
0.5	100 Hz		0.500	0.508	-0.008	1.9
0.6	100 Hz		0.600	0.609	-0.009	1.9
0.7	100 Hz		0.700	0.710	-0.010	1.9

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	3.035	-0.035	1.9
4	50 Hz		4.000	4.048	-0.048	1.9
5	50 Hz		5.000	5.067	-0.067	1.9
6	50 Hz		6.000	6.077	-0.077	1.9
7	50 Hz		7.000	7.092	-0.092	1.9
3	100 Hz	peak	3.000	3.030	-0.030	1.9
4	100 Hz		4.000	4.046	-0.046	1.9
5	100 Hz		5.000	5.059	-0.059	1.9
6	100 Hz		6.000	6.079	-0.079	1.9
7	100 Hz		7.000	7.102	-0.102	1.9

Certificate No. Q23122679

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



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	2.7
0.04	50 Hz		0.040	0.040	0.000	2.4
0.05	50 Hz		0.050	0.051	-0.001	2.2
0.06	50 Hz		0.060	0.061	-0.001	2.1
0.07	50 Hz		0.070	0.071	-0.001	2.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.7
0.04	100 Hz		0.040	0.040	0.000	2.4
0.05	100 Hz		0.050	0.051	-0.001	2.2
0.06	100 Hz		0.060	0.061	-0.001	2.1
0.07	100 Hz		0.070	0.071	-0.001	2.1

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 009 Page 1,2 of 59

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

End of Certificate

Certificate No. Q23122679

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เอกสารไม่ควบคุม

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12867/UM12867
CLID. NO. : 251801711
JOB CONTROL NO. : 230914102592

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

DATE OF RECEIVED : 14 September 2023

DATE OF ISSUED : 19 September 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

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. Q23102592

F3-011-04/01-12

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เอกสารไม่ควบคุม

Certificate No : 23-ACT-116
Request No : Req-2023-1545

Calibration Results : Without Adjustment

Sound pressure level

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.00	0.00	-	-	0.13	0.25
114 dB / 1000 Hz	113.90	-0.10	-	-	0.13	0.25
94 dB / 250 Hz	94.08	0.08	-	-	0.13	0.25
114 dB / 250 Hz	114.09	0.09	-	-	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	999.39	0.06	-	-	0.01	0.70
114 dB / 1000 Hz	999.35	0.06	-	-	0.01	0.70
94 dB / 250 Hz	250.74	0.30	-	-	0.01	0.70
114 dB / 250 Hz	250.72	0.29	-	-	0.01	0.70

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Measured (%)		
94 dB / 1000 Hz	0.25	-	0.40	2.5
114 dB / 1000 Hz	0.21	-	0.40	2.5
94 dB / 250 Hz	0.49	-	0.40	2.5
114 dB / 250 Hz	0.45	-	0.40	2.5

Note :

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

End of Calibration

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-7087-1-1-02 REV.00 10/05/2023 01/07/23

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 23-SLM-187
Address 81 Soi Udornsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2023-1166
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 : 26 May 2023
Calibrated Date : 2 June 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	SvanteK	Svan401	131	12 October 2023	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 %.



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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เอกสารไม่ควบคุม

Certificate No : 23-SLM-187
Request No : Req-2023-1166

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 37-139 Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114 dB	114.54	114.6	+0.06	114.5	-0.04	0.2	0.3

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 (dB)	UNCERTAINTY (± dB)
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	30.7	0.1

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

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	30.5	0.1
C	30.1	0.1
Z	34.1	0.1

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.0	0.1	0.0	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	1.2	1.2	1.2	0.6	3.0
8000 Hz	2.9	2.8	2.9	0.7	5.0

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.
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เอกสารไม่ควบคุม

Certificate No : 23-SLM-187
Request No : Req-2023-1166

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)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
63 Hz	-0.1	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	0.0	0.0	0.0		1.5
500 Hz	0.0	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.1	0.1	0.0		2.0
4000 Hz	0.0	0.1	0.0		3.0
8000 Hz	0.0	0.1	0.0		5
16000 Hz	0.0	-0.1	0.0		+5,-INF

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
37-139 / A	(dB)	(dB)	(dB)	(± dB)	(± dB)
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

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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เอกสารไม่ควบคุม

Certificate No : 23-SLM-187
Request No : Req-2023-1166

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(\pm dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	94.0	0.0	1.1
89.00	89	89.0	0.0	1.1
84.00	84	84.0	0.0	1.1
79.00	79	79.0	0.0	1.1
74.00	74	74.0	0.0	1.1
69.00	69	69.0	0.0	1.1
64.00	64	64.0	0.0	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.1	0.1	1.1
49.00	49	49.1	0.1	1.1
44.00	44	44.2	0.2	1.1
39.00	39	39.7	0.7	1.1

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.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-187
Request No : Req-2023-1166

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(\pm dB)
37-139	45.0	45.2	0.2	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(\pm dB)
Fast	200	135.0	135.0	0.0	1
	2	118.0	117.9	-0.1	+1.0, -2.5
	0.25	109.0	108.8	-0.2	+1.5, -5.0
Slow	200	128.6	128.5	-0.1	1
	2	109.0	108.9	-0.1	+1.0, -5.0
SEL	200	129.0	129.0	0.0	1
	2	109.0	108.9	-0.1	+1.0, -2.5
	0.25	100.0	99.9	-0.1	+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(\pm dB)
Complete cycle	137.4	136.9	-0.50	3.0
Positive half cycle	136.4	136.3	-0.10	2.0
Negative half cycle	136.4	136.3	-0.10	2.0

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.

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Certificate No : 23-SLM-187
Request No : Req-2023-1166

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	142.3		
Negative one-half cycle	142.5		
Deviated	-0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

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.

เอกสารไม่ควบคุม

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mailed-center@sithiphorn.com http://www.sithiphorn.com



Cert. No. : ACL22082
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : LARSON DAVIS
Model : LxT2/ Microphone 375B02 / Preampifier PRML x T2B
Serial No.: 0005289 / 011732 / 056076
ID No.: -

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK SUB-DISTRICT,
PHRAKHANONG DISTRICT, BANGKOK 10260
THAILAND.

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

Received Date : 18 JANUARY 2022
Calibration Date : 26 JANUARY 2022
Date of Issue : 28 JANUARY 2022

Calibrated by : Nathakorn Pisutpaisan

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

เอกสารไม่ควบคุม

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
Pages : 2 of 8

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

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

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

3.1 National Institute of Metrology (Thailand).

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

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
29.6

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

Frequency Weighting	Measured value (dB)
A - weight	29.4
C - weight	29.1
Flat	34.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.1	0.2	0.2	± 1.5
1000	-0.2	-0.2	-0.2	± 1.0
8000	2.6	2.6	2.6	±5.0

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
Pages : 3 of 8

Summary of Measurement Result :

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

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	-0.1	0.0	±3.0
8000	0.0	0.1	0.0	±5.0
16000	-0.1	0.1	0.1	±5.0(-∞)

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
Pages : 6 of 8

7. Level linearity on the reference level range

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

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.2	89.4	0.2	±1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
140	94.0	94.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.8	-0.2	1.5 ; -5.0
	2	8	117.0	116.7	-0.3	1.0 ; -2.5
	200	800	134.0	133.9	-0.1	±1.0
Slow	2	8	108.0	107.8	-0.2	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	N/A	N/A	N/A	1.5 ; -5.0
	2	8	N/A	N/A	N/A	1.0 ; -2.5
	200	800	N/A	N/A	N/A	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{cpeak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.8	-0.6	±3.0

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

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAE0,
AMPHOE BANG PHI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (660)-2116-5860-1 FAX: (660)-2116-7140

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Certificate of Calibration

Customer
Name UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 23-SLM-210
Address 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2023-1387
10260

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LxT2 Microphone S/N : 346386
Serial Number : 0005293 Preamplifier Model : PRMLxT2B
ID : UAE.EFM.108/2562 Preamplifier S/N : 056084
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 : 21 June 2023
Calibrated Date : 23 June 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svante	Svan401	131	12 October 2023	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 %.

Certificate No : 23-SLM-210

Request No : Req-2023-1387

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 37-139	Level	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
Calibrator Setting							
1000 Hz 114 dB	114.54	114.5	-0.04	114.5	-0.04	0.2	0.3

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 (dB)	UNCERTAINTY (\pm dB)
FAST / 37-139		
UUC Weighting		
A	24.1	0.1

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

UUC Setting	Measured (dB)	UNCERTAINTY (\pm dB)
FAST / 37-139		
UUC Weighting		
A	23.5	0.1
C	23.0	0.1
Z	27.5	0.1

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

UUC Setting	Deviation from various Frequency Weighting Resone curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 37-139	A	C	Z		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.1	0.1	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	0.0	0.0	0.1	0.6	3.0
8000 Hz	-0.6	-0.6	-0.5	0.7	5.0

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.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-210

Request No : Req-2023-1387

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

UUC Setting	Deviation from various Frequency Weighting Resone curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 37-139	A (dB)	C (dB)	Z (dB)		
STD Setting					
63 Hz	-0.2	-0.1	-0.1	0.2	2.0
125 Hz	-0.1	0.0	-0.1		1.5
250 Hz	-0.1	-0.1	-0.1		1.5
500 Hz	-0.1	0.0	-0.1		1.5
1000 Hz	0.0	0.0	-0.1		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	-0.1	0.0		5
16000 Hz	-0.1	-0.1	-0.1		+5,-INF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 37-139	REF	UUC (dB)	ERR (dB)		
UUC Weighting					
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
37-139 / A	REF	UUC (dB)	ERR (dB)		
UUC Time Resone					
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

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เอกสารไม่ควบคุม

Certificate No : 23-SLM-210

Request No : Req-2023-1387

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 37-139	REF	UUC (dB)	ERR (dB)		
STD dB	(dB)				
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	93.9	-0.1		1.1
89.00	89	88.9	-0.1		1.1
84.00	84	83.9	-0.1		1.1
79.00	79	78.9	-0.1		1.1
74.00	74	73.9	-0.1		1.1
69.00	69	68.9	-0.1		1.1
64.00	64	63.9	-0.1		1.1
59.00	59	58.9	-0.1		1.1
54.00	54	53.9	-0.1		1.1
49.00	49	49.0	0.0		1.1
44.00	44	44.0	0.0		1.1
39.00	39	39.1	0.1		1.1
34.00	34	34.4	0.4		1.1

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.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-210

Request No : Req-2023-1387

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A	REF	UUC (dB)	ERR (dB)		
UUC Range	(dB)				
37-139	39.3	39.5	0.2	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
A / 37-139	Toneburst (ms)	Ref (dB)	UUC (dB)	ERR (dB)		
UUC Time Resone						
Fast	200	135.0	135.0	0.0	0.2	1
	2	118.0	117.9	-0.1		+1.0,-2.5
	0.25	109.0	108.6	-0.4		+1.5,-5.0
Slow	200	128.6	128.5	-0.1		1
	2	109.0	108.9	-0.1		+1.0,-5.0
	200	129.0	129.0	0.0		1
SEL	2	109.0	109.1	+0.1		+1.0,-2.5
	0.25	100.0	99.8	-0.2		+1.5,-5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / C / 95-142	REF	UUC (dB)	ERR (dB)		
STD Setting	(dB)				
Complete cycle	137.4	136.6	-0.80	0.2	3.0
Positive half cycle	136.4	136.2	-0.20		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

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.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-210
Request No : Req-2023-1387

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	Limit
STD Setting	(dB)		(± dB)
Positive one-half cycle	142.5		
Negative one-half cycle	142.7		
Deviated	-0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	Limit
STD Setting	(dB)		(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

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.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-222
Request No : Req-2023-1410

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		(± dB)
1000 Hz 114 dB	113.77	114.0	+0.23	113.8	+0.03		0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 73246

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting		
A		0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting		
A		0.1
C	29.6	0.1
Z	33.8	0.1

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 37-139	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
125 Hz	0.1	0.1	0.1		2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	1.1	1.1	1.1	0.6	3.0
8000 Hz	2.7	2.7	2.7	0.7	5.0

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.

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 23-SLM-222
Address 81 Soi Udornasuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2023-1410
10260

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375B02
Model : LxT2 Microphone S/N : 011736
Serial Number : 0005294 Preamplifier Model : PRMLxT2B
ID : UAE.EFM.109/2562 Preamplifier S/N : 056083
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 : 26 June 2023
Calibrated Date : 28 June 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	SvanteK	Svan401	131	12 October 2023	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 %.

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.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-222
Request No : Req-2023-1410

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 37-139	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
63 Hz	-0.1	0.0	0.0		2.0
125 Hz	-0.1	0.1	0.0	0.2	1.5
250 Hz	0.0	0.0	0.0		1.5
500 Hz	0.0	0.1	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.1	0.1	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	0.0	0.0	0.1		5
16000 Hz	0.0	-0.1	-0.1		+5,-INF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / 37-139	REF	UUC	ERR	(± dB)	Limit
UUC Weighting	(dB)	(dB)	(dB)		(± dB)
A	114.00	114.0	0.0		0.2
C	114.00	114.0	0.0	0.2	0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
37-139 / A	REF	UUC	ERR	(± dB)	Limit
UUC Time Response	(dB)	(dB)	(dB)		(± dB)
Fast	114.00	114.0	0.0		0.1
Slow	114.00	114.0	0.0	0.2	0.1
Leq	114.00	114.0	0.0		0.1

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7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
143.00	143	142.9	-0.1	0.8
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	94.0	0.0	1.1
89.00	89	89.0	0.0	1.1
84.00	84	84.0	0.0	1.1
79.00	79	79.0	0.0	1.1
74.00	74	74.0	0.0	1.1
69.00	69	69.0	0.0	1.1
64.00	64	64.0	0.0	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.1	0.1	1.1
44.00	44	44.2	0.2	1.1
43.00	43	43.2	0.2	1.1
42.00	42	42.4	0.4	1.1
41.00	41	41.3	0.3	1.1
40.00	40	40.5	0.5	1.1

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9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	45.4	45.6	0.2	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	135.0	0.0	1
	2	118.0	117.6	-0.4	+1.0, -2.5
	0.25	109.0	108.5	-0.5	+1.5, -5.0
Slow	200	128.6	128.5	-0.1	1
	2	109.0	108.9	-0.1	+1.0, -5.0
SEL	200	129.0	129.0	0.0	1
	2	109.0	108.9	-0.1	+1.0, -2.5
	0.25	100.0	99.7	-0.3	+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	136.7	-0.70	3.0
Positive half cycle	136.4	136.2	-0.20	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

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12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	144.5		
Negative one-half cycle	144.5		
Deviated	0.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

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