

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ

Certificate of Calibration

Model Number: X1105DU
Description: Semi-micro Balance
Serial Number: 1123081854
ID No: BKK_F50004
Manufacturer: Mettler Toledo

Certificate No: 238C0071
Issued Date: Monday, February 13, 2023
Reference No: 203245
Page No: 3 of 3

Calibration Results : Without Adjustment

Repeatability		Excentricity (Off-center loading error)	
The repeatability is the ability of a weighing instrument to display nearly identical results under constant conditions when the same test article is measured successively placed in general repeatedly on the weighing pan or in the same container. The standard deviation is used to express repeatability quantitatively.		The excentricity loading error is plotted by the difference between the position of the load (in 1/3 or 1/4 of maximum capacity placed at the middle of the weighing pan and between each of four additional measurement points) (position defined according to Table 10C).	
Normal Value : (Low Load)	100,0000	Normal Value : Tolerance	A/A
Tolerance	100,0000	Difference	1
N/A	100,0000		2
	100,0000		3
Normal Value : (High Load)	100,0000		4
Tolerance	100,0000		5
N/A	100,0000		6
Standard Deviation			
		0.00003	

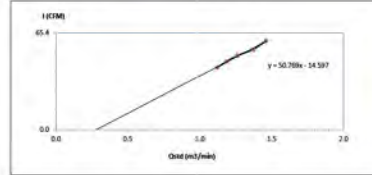
SOP FM 31 03 February 2022

High Volume Air Sampler Calibration Worksheet

Project Site: Asia Industrial Estate Co., Ltd.
Calibrator Location: A1/Thaichanong Road
Calibration Date: 22 Mar 23
Calibration/Client No: C-220523-BKK-F50067
Calibrator ID: BKK_F50024
Calibrator Model: TE-5020A
Calibrator S/N: 2584

Barometric Pressure (mm Hg): 758
Temperature (°C): 35
High Volume ID: BKK_F50067
High Volume Model: TE-5000S
High Volume S/N: 4342
Calibrator Slope: 1.63932
Calibrator Intercept: -0.01785

Test No.	Delta H ₂ O (m/s)	Q _{air} (m³/min)	I : Q _{air} (CFM)	Linear Regression
1	3.4	1.1228	42	Slope: 50.7692
2	3.8	1.1840	46	Intercept: -14.9375
3	4.3	1.2624	50	Correlation Coefficient: 0.9952
4	5.1	1.3761	54	
5	5.8	1.6610	60	



Calibrated by: FWH+ A.
Approved by: [Signature]
[Mr. Noppin Jitranont]
Senior Field Coordinator Scientist (3)

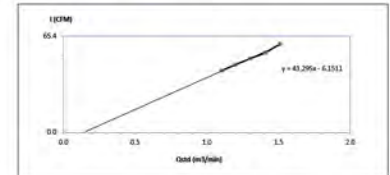
FORM NO. F 04-073 REVISION NO.: ISSUE DATE: 14/01/14

High Volume Air Sampler Calibration Worksheet

Project Site: Asia Industrial Estate Co., Ltd.
Calibrator Location: A1/Thaichanong Road
Calibration Date: 22 Mar 23
Calibration/Client No: C-220523-BKK-F50072
Calibrator ID: BKK_F50024
Calibrator Model: TE-5020A
Calibrator S/N: 2584

Barometric Pressure (mm Hg): 758
Temperature (°C): 35
High Volume ID: BKK_F50072
High Volume Model: TE-5000S
High Volume S/N: 5337
Calibrator Slope: 1.63932
Calibrator Intercept: -0.01785

Test No.	Delta H ₂ O (m/s)	Q _{air} (m³/min)	I : Q _{air} (CFM)	Linear Regression
1	3.4	1.1094	42	Slope: 43.2947
2	3.9	1.2012	46	Intercept: -6.1311
3	4.6	1.3031	50	Correlation Coefficient: 0.9989
4	5.4	1.4107	54	
5	6.2	1.5099	60	



Calibrated by: FWH+ A.
Approved by: [Signature]
[Mr. Noppin Jitranont]
Senior Field Coordinator Scientist (3)

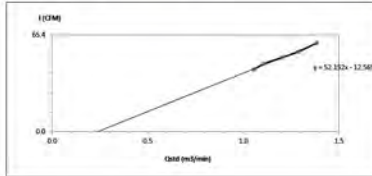
FORM NO. F 04-073 REVISION NO.: ISSUE DATE: 14/01/14

High Volume Air Sampler Calibration Worksheet

Project Site: Asia Industrial Estate Co., Ltd.
Calibrator Location: A1/Thaichanong Road
Calibration Date: 22 Mar 23
Calibration/Client No: C-220523-BKK-F50073
Calibrator ID: BKK_F50024
Calibrator Model: TE-5020A
Calibrator S/N: 2584

Barometric Pressure (mm Hg): 758
Temperature (°C): 35
High Volume ID: BKK_F50073
High Volume Model: TE-5000S
High Volume S/N: 124
Calibrator Slope: 1.63932
Calibrator Intercept: -0.01785

Test No.	Delta H ₂ O (m/s)	Q _{air} (m³/min)	I : Q _{air} (CFM)	Linear Regression
1	3.8	1.0537	42	Slope: 52.1321
2	3.3	1.1064	46	Intercept: -12.5653
3	3.9	1.2012	50	Correlation Coefficient: 0.9960
4	4.5	1.3090	54	
5	5.2	1.3843	60	



Calibrated by: FWH+ A.
Approved by: [Signature]
[Mr. Noppin Jitranont]
Senior Field Coordinator Scientist (3)

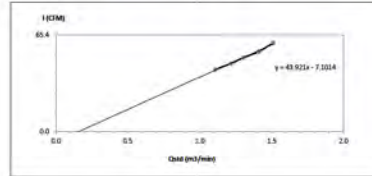
FORM NO. F 04-073 REVISION NO.: ISSUE DATE: 14/01/14

High Volume Air Sampler Calibration Worksheet

Project Site: Asia Industrial Estate Co., Ltd.
Calibrator Location: A1/Thaichanong Road
Calibration Date: 22 Mar 23
Calibration/Client No: C-220523-BKK-F50068
Calibrator ID: BKK_F50024
Calibrator Model: TE-5020A
Calibrator S/N: 2584

Barometric Pressure (mm Hg): 758
Temperature (°C): 35
High Volume ID: BKK_F50068
High Volume Model: TE-5000S
High Volume S/N: 509
Calibrator Slope: 1.63932
Calibrator Intercept: -0.01785

Test No.	Delta H ₂ O (m/s)	Q _{air} (m³/min)	I : Q _{air} (CFM)	Linear Regression
1	3.3	1.1094	42	Slope: 43.0200
2	4.0	1.2163	46	Intercept: -7.1014
3	4.6	1.3031	50	Correlation Coefficient: 0.9956
4	5.4	1.4107	54	
5	6.2	1.5099	60	



Calibrated by: FWH+ A.
Approved by: [Signature]
[Mr. Noppin Jitranont]
Senior Field Coordinator Scientist (3)

FORM NO. F 04-073 REVISION NO.: ISSUE DATE: 14/01/14

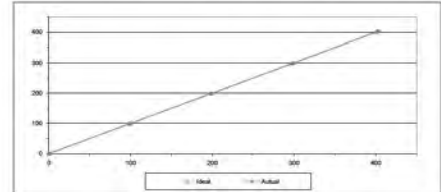


MULTIPOINT CALIBRATION REPORT

Calibration Date: 4 Jan 23
Manufacturer: Teledyne API
Serial No: 3489
Calibrator Manufacturer: Teledyne API
Serial No: 947
Std. Gas Concentration (PPM): 56.3
Cylinder Pressure (psi): 1800
Certified Date: 9 Feb 22

Equipment Name: SO2 Analyzer
Model: 100E
Equipment ID: BKK_F50075
Model: 700
Cylinder No: GNO027222
Certified By: Algas Inc.
Expired Date: 9 Feb 30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00
2	200.00	198.10	-1.90	-0.95
3	300.00	297.30	-2.70	-0.90
4	400.00	403.20	3.20	0.80
AVERAGE (%)				
-0.38				



Calibrated By: [Signature]
Approved By: [Signature]
[Mr. Jirawat Sakam]
Field Environmental Scientist (3)
[Mr. Sarayuth Jitranont]
Assistant General Manager

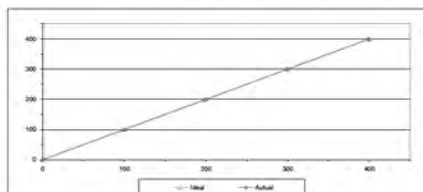
FORM NO. F 04-066 REVISION NO.: ISSUE DATE: 03/04/12

MULTIPOINT CALIBRATION REPORT

Calibration Date: 4 Jan 23
Manufacturer: HORIBA
Serial No: XHV1559F
Calibrator Manufacturer: Teledyne API
Serial No: 947
Std. Gas Concentration (PPM): 56.3
Cylinder Pressure (psi): 1800
Certified Date: 9 Feb 22

Equipment Name: SO2 Analyzer
Model: APSA-370
Equipment ID: BKK_F51087
Model: 700
Cylinder No: GNO027222
Certified By: Algas Inc.
Expired Date: 9 Feb 30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90
2	200.00	198.30	-1.70	-0.85
3	300.00	298.70	-1.30	-0.43
4	400.00	398.30	-1.70	-0.42
AVERAGE (%)				
-0.50				



Calibrated By: [Signature]
Approved By: [Signature]
[Mr. Jirawat Sakam]
Field Environmental Scientist (3)
[Mr. Sarayuth Jitranont]
Assistant General Manager

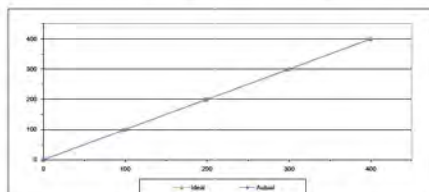
FORM NO. F 04-066 REVISION NO.: ISSUE DATE: 03/04/12

MULTIPOINT CALIBRATION REPORT

Calibration Date: 4 Jan 23
Manufacturer: HORIBA
Serial No: 88VW9P1K
Calibrator Manufacturer: Teledyne API
Serial No: 947
Std. Gas Concentration (PPM): 56.3
Cylinder Pressure (psi): 1800
Certified Date: 9 Feb 22

Equipment Name: SO2 Analyzer
Model: APSA-370
Equipment ID: BKK_F51081
Model: 700
Cylinder No: GNO027222
Certified By: Algas Inc.
Expired Date: 9 Feb 30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.60	-1.50	-1.50
2	200.00	198.30	-1.70	-0.85
3	300.00	297.80	-2.20	-0.70
4	400.00	398.30	-1.70	-0.38
AVERAGE (%)				
-0.67				



Calibrated By: [Signature]
Approved By: [Signature]
[Mr. Jirawat Sakam]
Field Environmental Scientist (3)
[Mr. Sarayuth Jitranont]
Assistant General Manager

FORM NO. F 04-066 REVISION NO.: ISSUE DATE: 03/04/12

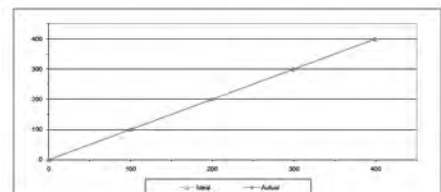


MULTIPOINT CALIBRATION REPORT

Calibration Date: 4 Jan 23
Manufacturer: HORIBA
Serial No: 25SLA620
Calibrator Manufacturer: Teledyne API
Serial No: 947
Std. Gas Concentration (PPM): 56.3
Cylinder Pressure (psi): 1800
Certified Date: 9 Feb 22

Equipment Name: SO2 Analyzer
Model: APSA-370
Equipment ID: BKK_F50802
Model: 700
Cylinder No: GNO027222
Certified By: Algas Inc.
Expired Date: 9 Feb 30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	101.00	1.00	1.00
2	200.00	199.50	-0.50	-0.25
3	300.00	298.30	-1.70	-0.57
4	400.00	398.00	-2.00	-0.50
AVERAGE (%)				
-0.04				



Calibrated By: [Signature]
Approved By: [Signature]
[Mr. Jirawat Sakam]
Field Environmental Scientist (3)
[Mr. Sarayuth Jitranont]
Assistant General Manager

FORM NO. F 04-066 REVISION NO.: ISSUE DATE: 03/04/12

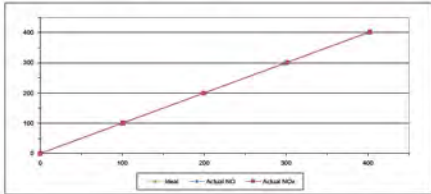


MULTIPOINT CALIBRATION REPORT

Calibration Date: 5-Jan-23
Manufacturer: Teledyne API
Serial No.: 4379
Calibrator Manufacturer: Teledyne API
Serial No.: 947
Std. Gas Concentration (PPM): 55.88
Cylinder Pressure (psi): 1800
Certified Date: 9-Feb-22

Equipment Name: NOx Analyzer
Model: 200E
Equipment ID: BKX F50776
Model: 700
Cylinder No.: GN027222
Certified By: Aigas Inc.
Expired Date: 9-Feb-30

CALIBRATION RESULTS									
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx	Actual NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	101.10	1.10	1.10	1.00	1.00
2	200.00	199.30	-0.70	-0.35	199.20	-0.80	-0.40	200.00	0.40
3	300.00	297.40	-2.60	-0.87	301.40	1.40	0.47	300.00	0.33
4	400.00	401.50	1.50	0.38	402.10	2.10	0.53	400.00	0.50
AVERAGE (%)				-0.33			0.38		



Calibrated By

Approved By

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

(Mr. Sarayuth Jittanon)
Assistant General Manager

ALS Laboratory One
FORM NO. J-06-06 REVISION NO. 1 ISSUE DATE: 02/04/12

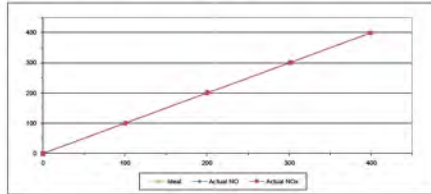


MULTIPOINT CALIBRATION REPORT

Calibration Date: 5-Jan-23
Manufacturer: HORIBA
Serial No.: TLATGOW
Calibrator Manufacturer: Teledyne API
Serial No.: 947
Std. Gas Concentration (PPM): 55.88
Cylinder Pressure (psi): 1800
Certified Date: 9-Feb-22

Equipment Name: NOx Analyzer
Model: APNA-370
Equipment ID: BKX F50785
Model: 700
Cylinder No.: GN027222
Certified By: Aigas Inc.
Expired Date: 9-Feb-30

CALIBRATION RESULTS									
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx	Actual NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00	100.50	0.50	0.50	100.00	0.50
2	200.00	199.50	-0.50	-0.25	200.70	0.70	0.35	200.00	0.35
3	300.00	299.50	-0.50	-0.17	301.10	1.10	0.37	300.00	0.37
4	400.00	398.70	-1.30	-0.33	399.00	-1.00	-0.25	400.00	0.25
AVERAGE (%)				-0.36			0.21		



Calibrated By

Approved By

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

(Mr. Sarayuth Jittanon)
Assistant General Manager

ALS Laboratory One
FORM NO. J-06-06 REVISION NO. 1 ISSUE DATE: 02/04/12

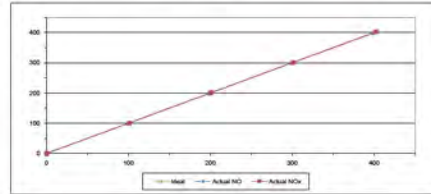


MULTIPOINT CALIBRATION REPORT

Calibration Date: 5-Jan-23
Manufacturer: HORIBA
Serial No.: XLTWBLSJ
Calibrator Manufacturer: Teledyne API
Serial No.: 947
Std. Gas Concentration (PPM): 55.88
Cylinder Pressure (psi): 1800
Certified Date: 9-Feb-22

Equipment Name: NOx Analyzer
Model: APNA-370
Equipment ID: BKX F51092
Model: 700
Cylinder No.: GN027222
Certified By: Aigas Inc.
Expired Date: 9-Feb-30

CALIBRATION RESULTS									
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx	Actual NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30	101.00	1.00	1.00	1.00	1.00
2	200.00	198.10	-1.90	-0.95	201.00	1.00	0.50	200.00	0.50
3	300.00	299.10	-0.90	-0.30	301.40	1.40	0.47	300.00	0.47
4	400.00	398.20	-1.80	-0.45	402.80	2.80	0.70	400.00	0.70
AVERAGE (%)				-0.38			0.35		



Calibrated By

Approved By

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

(Mr. Sarayuth Jittanon)
Assistant General Manager

ALS Laboratory One
FORM NO. J-06-06 REVISION NO. 1 ISSUE DATE: 02/04/12

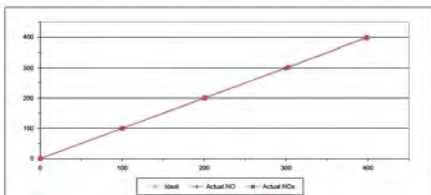


MULTIPOINT CALIBRATION REPORT

Calibration Date: 5-Jan-23
Manufacturer: HORIBA
Serial No.: XBRAX020
Calibrator Manufacturer: Teledyne API
Serial No.: 947
Std. Gas Concentration (PPM): 55.88
Cylinder Pressure (psi): 1800
Certified Date: 9-Feb-22

Equipment Name: NOx Analyzer
Model: APNA-370
Equipment ID: BKX F50803
Model: 700
Cylinder No.: GN027222
Certified By: Aigas Inc.
Expired Date: 9-Feb-30

CALIBRATION RESULTS									
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx	Actual NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20	100.50	0.50	0.50	100.00	0.50
2	200.00	201.50	1.50	0.75	201.20	1.20	0.60	200.00	0.60
3	300.00	298.40	-1.60	-0.53	302.30	2.30	0.77	300.00	0.77
4	400.00	396.10	-3.90	-0.98	398.50	-1.50	-0.38	400.00	0.38
AVERAGE (%)				-0.23			0.32		



Calibrated By

Approved By

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

(Mr. Sarayuth Jittanon)
Assistant General Manager

ALS Laboratory One
FORM NO. J-06-06 REVISION NO. 1 ISSUE DATE: 02/04/12



Accredited calibration laboratory
ISO/IEC 17025:2017
NAC 100-10-1000
CALIBRATION DEPARTMENT

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM: Gas analyser
MANUFACTURER: Teledyne
MODEL: 947-001
SERIAL NUMBER: 4379
ID NUMBER: 4379
CONDITION AS RECEIVED: CUSTOMER

MEASUREMENT DATE: 12 Feb 2023
ISSUE DATE: 12 Feb 2023

ENVIRONMENTAL CONDITIONS:
Ambient conditions in the laboratory are as follows:
Temperature: 23.0 ± 0.5 °C
Relative Humidity: 55.0 ± 5.0 %RH
Atmospheric Pressure: 1013.0 ± 0.5 hPa

PLACE OF CALIBRATION: (If other than wind tunnel of Jirananee Associates Co., Ltd.)

CALIBRATION CONDITIONS:
Wind speed: 3.0 m/s
Wind direction: 90°
Density of medium: 1.2 kg/m³
Buoyancy of test object: 0.11 N

Preconditioning: 24 hours at ambient conditions.
Measurement conditions: The average value during measurement are 23.0 °C, 55.0 %RH and 1013.0 hPa.

EVALUATION OF RESULTS:
The table on next page give the following values:

Calibrated by: (Mr. Jirawat Sakam)
Approved by: (Mr. Sarayuth Jittanon)
Signature: (Mr. Sarayuth Jittanon)
Signature: (Mr. Jirawat Sakam)

Remarks:
1. Fully independent and of the wind tunnel.
2. Fully independent and of the wind tunnel.
3. Fully independent and of the wind tunnel.

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



Accredited calibration laboratory
ISO/IEC 17025:2017
NAC 100-10-1000
CALIBRATION DEPARTMENT

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM: Gas analyser
MANUFACTURER: Teledyne
MODEL: 947-001
SERIAL NUMBER: 4379
ID NUMBER: 4379
CONDITION AS RECEIVED: CUSTOMER

MEASUREMENT DATE: 12 Feb 2023
ISSUE DATE: 12 Feb 2023

ENVIRONMENTAL CONDITIONS:
Ambient conditions in the laboratory are as follows:
Temperature: 23.0 ± 0.5 °C
Relative Humidity: 55.0 ± 5.0 %RH
Atmospheric Pressure: 1013.0 ± 0.5 hPa

PLACE OF CALIBRATION: (If other than wind tunnel of Jirananee Associates Co., Ltd.)

CALIBRATION CONDITIONS:
Wind speed: 3.0 m/s
Wind direction: 90°
Density of medium: 1.2 kg/m³
Buoyancy of test object: 0.11 N

Preconditioning: 24 hours at ambient conditions.
Measurement conditions: The average value during measurement are 23.0 °C, 55.0 %RH and 1013.0 hPa.

EVALUATION OF RESULTS:
The table on next page give the following values:

Calibrated by: (Mr. Jirawat Sakam)
Approved by: (Mr. Sarayuth Jittanon)
Signature: (Mr. Sarayuth Jittanon)
Signature: (Mr. Jirawat Sakam)

Remarks:
1. Fully independent and of the wind tunnel.
2. Fully independent and of the wind tunnel.
3. Fully independent and of the wind tunnel.

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CERTIFICATE OF CALIBRATION

Accredited calibration laboratory
ISO/IEC 17025:2017
NAC 100-10-1000
CALIBRATION DEPARTMENT

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM: Gas analyser
MANUFACTURER: Teledyne
MODEL: 947-001
SERIAL NUMBER: 4379
ID NUMBER: 4379
CONDITION AS RECEIVED: CUSTOMER

MEASUREMENT DATE: 12 Feb 2023
ISSUE DATE: 12 Feb 2023

ENVIRONMENTAL CONDITIONS:
Ambient conditions in the laboratory are as follows:
Temperature: 23.0 ± 0.5 °C
Relative Humidity: 55.0 ± 5.0 %RH
Atmospheric Pressure: 1013.0 ± 0.5 hPa

PLACE OF CALIBRATION: (If other than wind tunnel of Jirananee Associates Co., Ltd.)

CALIBRATION CONDITIONS:
Wind speed: 3.0 m/s
Wind direction: 90°
Density of medium: 1.2 kg/m³
Buoyancy of test object: 0.11 N

Preconditioning: 24 hours at ambient conditions.
Measurement conditions: The average value during measurement are 23.0 °C, 55.0 %RH and 1013.0 hPa.

EVALUATION OF RESULTS:
The table on next page give the following values:

Calibrated by: (Mr. Jirawat Sakam)
Approved by: (Mr. Sarayuth Jittanon)
Signature: (Mr. Sarayuth Jittanon)
Signature: (Mr. Jirawat Sakam)

Remarks:
1. Fully independent and of the wind tunnel.
2. Fully independent and of the wind tunnel.
3. Fully independent and of the wind tunnel.

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Accredited calibration laboratory
ISO/IEC 17025:2017
NAC 100-10-1000
CALIBRATION DEPARTMENT

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM: Gas analyser
MANUFACTURER: Teledyne
MODEL: 947-001
SERIAL NUMBER: 4379
ID NUMBER: 4379
CONDITION AS RECEIVED: CUSTOMER

MEASUREMENT DATE: 12 Feb 2023
ISSUE DATE: 12 Feb 2023

ENVIRONMENTAL CONDITIONS:
Ambient conditions in the laboratory are as follows:
Temperature: 23.0 ± 0.5 °C
Relative Humidity: 55.0 ± 5.0 %RH
Atmospheric Pressure: 1013.0 ± 0.5 hPa

PLACE OF CALIBRATION: (If other than wind tunnel of Jirananee Associates Co., Ltd.)

CALIBRATION CONDITIONS:
Wind speed: 3.0 m/s
Wind direction: 90°
Density of medium: 1.2 kg/m³
Buoyancy of test object: 0.11 N

Preconditioning: 24 hours at ambient conditions.
Measurement conditions: The average value during measurement are 23.0 °C, 55.0 %RH and 1013.0 hPa.

EVALUATION OF RESULTS:
The table on next page give the following values:

Calibrated by: (Mr. Jirawat Sakam)
Approved by: (Mr. Sarayuth Jittanon)
Signature: (Mr. Sarayuth Jittanon)
Signature: (Mr. Jirawat Sakam)

Remarks:
1. Fully independent and of the wind tunnel.
2. Fully independent and of the wind tunnel.
3. Fully independent and of the wind tunnel.

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

QF-TS12-04-01-00064

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Sound test

Measured Value (dB)
14.8

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

Frequency Weighting (dB)	Measured value (dB)
A-weight	11.6
C-weight	17.5
Flat	23.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)	Acceptance Limits (dB)
125	0.1	±1.5
1000	-0.1	±1.0
10000	-1.7	±5.0

QP-TS12-04-04-020664

T. Petch.

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits (dB)
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
10000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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
Lay	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

QP-TS12-04-04-020664

T. Petch.

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1

QP-TS12-04-04-020664

T. Petch.

Cert. No. : ACL22244
Job No. : VC65AC0090
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)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.8	-0.1	1.5 / -5.0
		8	117.0	117.0	0.0	1.0 / -2.5
Slow	0.25	1	108.0	108.0	0.0	1.5 / -5.0
		8	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 / -5.0
		8	108.0	108.0	0.0	1.0 / -2.5

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.7	-0.7	±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	133.4	133.3	-0.2	±2.0
Negative half cycle	133.4	133.2	-0.2	±2.0

QP-TS12-04-04-020664

T. Petch.

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.7	0.1	±1.5

12. High level stability

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

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

End of Calibration Certificate

QP-TS12-04-04-020664

T. Petch.

43-45/11 Sathorn Rd, Bangkok, Bangkok 10120 THAILAND
Tel: 02-2455-8800 Fax: 02-2455-1079 E-mail: cal@csithiporn.com Web: www.csithiporn.comCert. No. : ACL22660
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : EBRON
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0029512 / (7911) / (8752)
ID No. : BKR, P9966

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHUANG PHATTANAKAN, KHUANG SUAN LUANG,
BANGKOK, 10250 THAILAND.Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 17 JANUARY 2023
Calibration Date : 19-20 JANUARY 2023
Date of Issue : 23 JANUARY 2023

Calibrated by : Natchanon Petchum

Approved by : T. Petch.
(Thanakol Petchum)This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
other than in full, except with the prior written approval of the head of Calibration Laboratory.

QP-TS12-04-04-020664

Cert. No. : ACL22660
Job No. : VC66AC0026
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had been to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference
Standard Instruments.
Five tests results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	35710A	MY48013076	IT-0007-22	04-Feb-21
Waveform Generator	33511B	MY52102742	IT-0006-20	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP, 04/02/25	09-Feb-21
Digital Multimeter	34461A	MY53220076	EEL-BP, 04/02/25	09-Feb-21
Digital Multimeter	34461A	MY60024273	EEL-BP, 05/02/25	09-Feb-21
Programmable Attenuator	MA1-1070	62109114	IT-0009-22	07-Feb-21
Condenser Microphone	4130	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA	34560495	AA-3005-22	22-Feb-21

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

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

3.1 National Institute of Metrology (Thailand).

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

QP-TS12-04-04-020664

T. Petch.

Cert. No. : ACL22660
Job No. : VC66AC0026
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	✓	-	0.3	0.6
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	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.2	0.7
For > 4 kHz to 10 kHz	✓	-	0.2	0.7
For > 10 kHz to 20 kHz	✓	-	0.2	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

QP-TS12-04-04-020664

T. Petch.

Cert. No. : ACL22660
Job No. : VC66AC0026
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Sound test

Measured Value (dB)
14.2

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

Frequency Weighting (dB)	Measured value (dB)
A-weight	10.8
C-weight	17.1
Flat	22.8

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)	Acceptance Limits (dB)
125	0.1	±1.5
1000	0.0	±1.0
10000	-0.5	±5.0

QP-TS12-04-04-020664

T. Petch.

Cert. No. : ACL23050
Job No. : VC66AC0026
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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 weightings 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
Log	94.0	0.0	±0.1

6. Long-term stability

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

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Cert. No. : ACL23050
Job No. : VC66AC0026
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	-	-
Negative one-half cycle	-	-
89.5	89.8	0.3

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

QP-TS12-04-04-02064

Cert. No. : ACL23050
Job No. : VC66AC0026
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
130.0	129.9	-0.1	±1.1
129.0	129.0	0.0	±1.1
128.0	128.0	0.0	±1.1
127.0	127.0	0.0	±1.1
126.0	126.0	0.0	±1.1
125.0	125.0	0.0	±1.1
124.0	124.0	0.0	±1.1
123.0	123.0	0.0	±1.1
122.0	122.0	0.0	±1.1
121.0	121.0	0.0	±1.1
120.0	120.0	0.0	±1.1
119.0	119.0	0.0	±1.1
118.0	118.0	0.0	±1.1
117.0	117.0	0.0	±1.1
116.0	116.0	0.0	±1.1
115.0	115.0	0.0	±1.1
114.0	114.0	0.0	±1.1
113.0	113.0	0.0	±1.1
112.0	112.0	0.0	±1.1
111.0	111.0	0.0	±1.1
110.0	110.0	0.0	±1.1
109.0	109.0	0.0	±1.1
108.0	108.0	0.0	±1.1
107.0	107.0	0.0	±1.1
106.0	106.0	0.0	±1.1
105.0	105.0	0.0	±1.1
104.0	104.0	0.0	±1.1
103.0	103.0	0.0	±1.1
102.0	102.0	0.0	±1.1
101.0	101.0	0.0	±1.1
100.0	100.0	0.0	±1.1
99.0	99.0	0.0	±1.1
98.0	98.0	0.0	±1.1
97.0	97.0	0.0	±1.1
96.0	96.0	0.0	±1.1
95.0	95.0	0.0	±1.1
94.0	94.0	0.0	±1.1
93.0	93.0	0.0	±1.1
92.0	92.0	0.0	±1.1
91.0	91.0	0.0	±1.1
90.0	90.0	0.0	±1.1
89.0	89.0	0.0	±1.1
88.0	88.0	0.0	±1.1
87.0	87.0	0.0	±1.1
86.0	86.0	0.0	±1.1
85.0	85.0	0.0	±1.1
84.0	84.0	0.0	±1.1
83.0	83.0	0.0	±1.1
82.0	82.0	0.0	±1.1
81.0	81.0	0.0	±1.1
80.0	80.0	0.0	±1.1
79.0	79.0	0.0	±1.1
78.0	78.0	0.0	±1.1
77.0	77.0	0.0	±1.1
76.0	76.0	0.0	±1.1
75.0	75.0	0.0	±1.1
74.0	74.0	0.0	±1.1
73.0	73.0	0.0	±1.1
72.0	72.0	0.0	±1.1
71.0	71.0	0.0	±1.1
70.0	70.0	0.0	±1.1
69.0	69.0	0.0	±1.1
68.0	68.0	0.0	±1.1
67.0	67.0	0.0	±1.1
66.0	66.0	0.0	±1.1
65.0	65.0	0.0	±1.1
64.0	64.0	0.0	±1.1
63.0	63.0	0.0	±1.1
62.0	62.0	0.0	±1.1
61.0	61.0	0.0	±1.1
60.0	60.0	0.0	±1.1
59.0	59.0	0.0	±1.1
58.0	58.0	0.0	±1.1
57.0	57.0	0.0	±1.1
56.0	56.0	0.0	±1.1
55.0	55.0	0.0	±1.1
54.0	54.0	0.0	±1.1
53.0	53.0	0.0	±1.1
52.0	52.0	0.0	±1.1
51.0	51.0	0.0	±1.1
50.0	50.0	0.0	±1.1
49.0	49.0	0.0	±1.1
48.0	48.0	0.0	±1.1
47.0	47.0	0.0	±1.1
46.0	46.0	0.0	±1.1
45.0	45.0	0.0	±1.1
44.0	44.0	0.0	±1.1
43.0	43.0	0.0	±1.1
42.0	42.0	0.0	±1.1
41.0	41.0	0.0	±1.1
40.0	40.0	0.0	±1.1
39.0	39.0	0.0	±1.1
38.0	38.0	0.0	±1.1
37.0	37.0	0.0	±1.1
36.0	36.0	0.0	±1.1
35.0	35.0	0.0	±1.1
34.0	34.0	0.0	±1.1
33.0	33.0	0.0	±1.1
32.0	32.0	0.0	±1.1
31.0	31.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	25.0	0.0	±1.1

QP-TS12-04-04-02064

451-451/1 Silekham Rd, Bangna, Bangkok 10700 THAILAND
Tel: 02-2435-8900 Fax: 02-2435-8679 e-mail: center@stiporn.com http://www.stiporn.comCert. No. : ACL23051
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NR-42 / Microphone UC-52 / Pre-amplifier NR-24
Serial No. : 0296513 / 179115 / 87522
ID No. : BKK_P5970

Condition As Found : GOOD

Customer : ALSI LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHWAENG PHATHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

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

Received Date : 17 JANUARY 2023
Calibration Date : 19-20 JANUARY 2023
Date of Issue : 23 JANUARY 2023

Calibrated by : Natchanon Petchumai

Approved by : T. Petchumai

(Thanakul Petchumai)

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.

QP-TS12-04-04-02064

Cert. No. : ACL23050
Job No. : VC66AC0026
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)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 / -0.0
	2	8	117.0	116.9	-0.1	1.0 / -2.5
Slow	200	800	134.0	134.0	0.0	±0.0
	2	8	108.0	108.0	0.0	1.5 / -5.0
SEL	200	800	127.0	127.0	0.0	±0.0
	0.25	1	99.0	98.8	-0.2	1.5 / -5.0
	2	8	108.0	108.0	0.0	1.0 / -2.5
	200	800	128.0	128.0	0.0	±0.0

10. Peak C sound level

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	-
Onset	136.4	136.4	0.0	±0.0

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	-0.1	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QP-TS12-04-04-02064

Cert. No. : ACL23051
Job No. : VC66AC0026
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Anemochamber and Reference
Standard Instruments.
For test results of each item were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	IT-0007-22	04-Feb-23
Waveform Generator	33511B	MY53202742	EF-0008-22	04-Feb-23
Digital Multimeter	3340A	MY53220104	EEL-BP_040265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_030265	09-Feb-23
Digital Multimeter	34461A	MY60054273	EEL-BP_050265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977500	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA	34560495	AA-3005-22	22-Feb-23

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).

QP-TS12-04-04-02064

Cert. No. : ACL23051
Job No. : VC66AC0026
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	✓	-	0.3	0.6
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	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
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

QP-TS12-04-04-02064

Cert. No. : ACL23051
Job No. : VC66AC0026
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	10.8
C-weight	16.8
Flat	22.7

Cert. No. : ACL23051
Job No. : VC66AC0026
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.1	0.1	±1.1
26.0	26.1	0.1	±1.1
25.0	25.3	0.3	±1.1

QP-TS12-04-04-020604

T. Petch

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

431-4311 Sathorn Rd, Bangum, Bangkok 10700 THAILAND
Tel: 02-2433-8809 Fax: 02-2433-1079 e-mail: cal@calibrationlab.com http://www.sithiporn.com



Cert. No. : ACL22285
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NR-02 Microphone UC-52 / Piezoelectric SR1-24
Serial No. : 0672562 / 770470 / 72961
ID No. : BKK-750878

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 43, PHATHANAKAN ROAD,
KHAO SANG PHATHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

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

Received Date : 30 NOVEMBER 2022
Calibration Date : 13-16 DECEMBER 2022
Date of Issue : 19 DECEMBER 2022

Calibrated by : Nattakorn Petchum

Approved by : T. Petch
(Thakul Petchum)

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

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T. Petch

Cert. No. : ACL23051
Job No. : VC66AC0026
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)
Ann	94.0	94.0	0.0	±1.1

9. Tone burst response

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

10. Peak C sound level

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	-
One	136.4	135.6	-0.8	±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	135.2	-0.2	±2.0
Negative half cycle	135.4	135.3	-0.2	±2.0

QP-TS12-04-04-020604

T. Petch

SITHIPORN / SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22285
Job No. : VC66AC0015
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-1 (2013) Standard for sound level meter (SLM). The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017075	ET-9007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	ET-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-RP-040265	09-Feb-23
Digital Multimeter	33461A	MY53220075	EEL-RP-050265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-RP-050265	09-Feb-23
Programmable Attenuator	MAF-1070	6230114	ET-0009-22	07-Feb-23
Condenser Microphone	4190	2977990	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAJ	34509495	AA-0905-22	22-Feb-23

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 units maintained at :

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

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T. Petch

Cert. No. : ACL23051
Job No. : VC66AC0026
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

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

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

End of Calibration Certificate

QP-TS12-04-04-020604

T. Petch

SITHIPORN / SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22285
Job No. : VC66AC0015
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	✓	-	0.3	0.6
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	✓	-	0.3	0.6
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	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.3	0.3
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	0.7
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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T. Petch

SITHIPORN / SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22285
Job No. : VC66AC0015
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Measured value (dB)
A-weight	22.0
C-weight	18.1
Flat	23.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.1	0.1	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-1.0	-0.9	-0.9	±5.0

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T. Petch

SITHIPORN / SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22285
Job No. : VC66AC0015
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.3
500	0.0	0.0	-0.1	±1.3
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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 weightings 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
Log	94.0	0.0	±0.1

6. Long-term stability

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

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22285
Job No. : VC66AC0015
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.1	0.1	±1.1
28.0	28.1	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.1	0.1	±1.1
25.0	25.3	0.3	±1.1

QP-TS12-04-04-020604

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22302
Job No. : VC66AC0015
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)
Auto	94.0	94.0	0.0	±1.5

9. Time burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	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	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QP-TS12-04-04-02064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL22302
Job No. : VC66AC0015
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11. Overload indication

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

12. High level stability

Frequency Weighting	S.L.M Display at initial (dB)	S.L.M 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

QP-TS12-04-04-02064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL22302
Job No. : VC66AC0016
Pages : 2 of 8

Calibration Procedure : CPAC-01

Calibration Method :

This equipment was calibrated by hand on IEC-61672-1 (2013) Standard for sound level meter (SLM). The SLM had been to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	EE-0007-32	04-Feb-23
Waveform Generator	33511B	MY53202742	EE-0008-22	04-Feb-23
Digital Multimeter	34461A	MY53200104	EEL-BP-040265	09-Feb-23
Digital Multimeter	34461A	MY53200076	EEL-BP-040265	09-Feb-23
Digital Multimeter	34461A	MY60004273	EEL-BP-050265	09-Feb-23
Programmable Attenuator	MAF-100P	82130114	EE-0009-22	07-Feb-23
Condenser Microphone	4130	297900	AA-1013-02	24-Feb-23
Measuring Amplifier	NA-42KA	34509495	AA-0305-22	22-Feb-23

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).

QP-TS12-04-04-02064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL22302
Job No. : VC66AC0016
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.7	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.6
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	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.2	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. Time burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL22302
Job No. : VC66AC0016
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz:

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	0.0	±0.2
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
1sq	94.0	0.0	±0.1

6. Long-term stability

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

QP-TS12-04-04-02064

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL22302
Job No. : VC66AC0016
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
127.0	127.0	0.0	±1.1
126.0	126.0	0.0	±1.1
125.0	125.0	0.0	±1.1
124.0	124.0	0.0	±1.1
123.0	123.0	0.0	±1.1
122.0	122.0	0.0	±1.1
121.0	121.0	0.0	±1.1
120.0	120.0	0.0	±1.1
119.0	119.0	0.0	±1.1
118.0	118.0	0.0	±1.1
117.0	117.0	0.0	±1.1
116.0	116.0	0.0	±1.1
115.0	115.0	0.0	±1.1
114.0	114.0	0.0	±1.1
113.0	113.0	0.0	±1.1
112.0	112.0	0.0	±1.1
111.0	111.0	0.0	±1.1
110.0	110.0	0.0	±1.1
109.0	109.0	0.0	±1.1
108.0	108.0	0.0	±1.1
107.0	107.0	0.0	±1.1
106.0	106.0	0.0	±1.1
105.0	105.0	0.0	±1.1
104.0	104.0	0.0	±1.1
103.0	103.0	0.0	±1.1
102.0	102.0	0.0	±1.1
101.0	101.0	0.0	±1.1
100.0	100.0	0.0	±1.1
99.0	99.0	0.0	±1.1
98.0	98.0	0.0	±1.1
97.0	97.0	0.0	±1.1
96.0	96.0	0.0	±1.1
95.0	95.0	0.0	±1.1
94.0	94.0	0.0	±1.1
93.0	93.0	0.0	±1.1
92.0	92.0	0.0	±1.1
91.0	91.0	0.0	±1.1
90.0	90.0	0.0	±1.1
89.0	89.0	0.0	±1.1
88.0	88.0	0.0	±1.1
87.0	87.0	0.0	±1.1
86.0	86.0	0.0	±1.1
85.0	85.0	0.0	±1.1
84.0	84.0	0.0	±1.1
83.0	83.0	0.0	±1.1
82.0	82.0	0.0	±1.1
81.0	81.0	0.0	±1.1
80.0	80.0	0.0	±1.1
79.0	79.0	0.0	±1.1
78.0	78.0	0.0	±1.1
77.0	77.0	0.0	±1.1
76.0	76.0	0.0	±1.1
75.0	75.0	0.0	±1.1

QP-TS12-04-04-02064

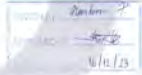
T. Petchum

451-451/1 Sithiporn Rd., Bangnae, Bangkok 10110 THAILAND
Tel: 0-2433-8803 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL22302
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : KISON
Model : NL-02/Microphone UC-52 / Preamplifier NH-24
Serial No. : 0085821 / 15876 / 58767
ID No. : BKK F50111

Condition As Found : GOOD

Customer : A.S. LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHUANG PHATTANAKAN, KHUANG SUAN LUANG,
BANGKOK, 10250 THAILAND.Location :
Ambient Temperature : (31.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 07 DECEMBER 2022
Calibration Date : 16-20 DECEMBER 2022
Date of Issue : 21 DECEMBER 2022

Calibrated by : Natchanon Petchum

Approved by : T. Petchum
(Thakol Petchum)

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QP-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL22302
Job No. : VC66AC0016
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
93.0 (93.0)	93.9	0.9	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	18.1
Flat	23.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.4	±1.5
1000	0.1	0.0	0.0	±1.0
8000	-1.0	-1.8	-1.8	±5.0

QP-TS12-04-04-02064

T. Petchum

Cert. No. : ACL23088
Job No. : VC66AC0826
Pages : 3 of 8

11. Overall indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.7	89.7	0.0
		+1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	+0.5

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

431-451/1 Srinakharin Rd., Bangkok, Bangkok 10700 THAILAND
Tel:02-2433-8800 Fax:02-2433-1679 e-mail:center@stihp.com http://www.stihp.com



Cert. No. : ACL23088
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 0087305 / 171587 / 73329
ID No. : RKK JS0900

Condition As Found : GOOD

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

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

Received Date : 17 JANUARY 2023
Calibration Date : 19-20 JANUARY 2023
Date of Issue : 23 JANUARY 2023

Calibrated by : Nidhan Pitsayaporn

Approved by : T. Petch-
(Thanak Petchani)

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QP-TS12-04-04-02064

Cert. No. : ACL23088
Job No. : VC66AC0826
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	✓	✗	0.2	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	0.7
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	0.2
8. Level linearity including the level range control	✓	✗	0.2	0.2
9. Time burst response	✓	✗	0.2	0.3
10. Peak C sound level	✓	✗	0.2	0.35
11. Overall indication	✓	✗	0.2	0.25
12. High level stability	✓	✗	0.1	0.1

QP-TS12-04-04-02064

Cert. No. : ACL23088
Job No. : VC66AC0826
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	+1.1
136.0	136.0	0.0	+1.1
135.0	135.0	0.0	+1.1
134.0	134.0	0.0	+1.1
133.0	133.0	0.0	+1.1
132.0	132.0	0.0	+1.1
131.0	131.0	0.0	+1.1
129.0	129.0	0.0	+1.1
124.0	124.0	0.0	+1.1
119.0	119.0	0.0	+1.1
114.0	114.0	0.0	+1.1
109.0	109.0	0.0	+1.1
104.0	104.0	0.0	+1.1
99.0	99.0	0.0	+1.1
94.0	94.0	0.0	+1.1
89.0	89.0	0.0	+1.1
84.0	84.0	0.0	+1.1
79.0	79.0	0.0	+1.1
74.0	74.0	0.0	+1.1
69.0	69.0	0.0	+1.1
64.0	64.0	0.0	+1.1
59.0	59.0	0.0	+1.1
54.0	53.9	-0.1	+1.1
49.0	49.0	0.0	+1.1
44.0	44.0	0.0	+1.1
39.0	38.9	-0.1	+1.1
34.0	33.9	-0.1	+1.1
30.0	29.9	-0.1	+1.1
26.0	25.9	-0.1	+1.1
22.0	21.9	-0.1	+1.1
18.0	17.9	-0.1	+1.1
14.0	13.9	-0.1	+1.1
10.0	9.9	-0.1	+1.1

QP-TS12-04-04-02064

Cert. No. : ACL23088
Job No. : VC66AC0826
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
93.9 (93.95)	93.9	0.0	+0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Measured Value (dB)
A-weight	11.6
C-weight	17.8
Flat	

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 64 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)	Acceptance Limits
125	0.1	± 1.5
1000	0.0	± 1.0
8000	-0.2	± 0.3

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Cert. No. : ACL23088
Job No. : VC66AC0826
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)
Auto	94.0	94.0	0.0	+1.1

9. Time burst response

Time Weighting	Time burst duration, Ts (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
Slow	200	800	124.0	124.0	0.0	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.5 ; -5.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	± 1.0

10. Peak C sound level

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	-
One	136.4	135.5	-0.9	± 0.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	131.0	131.0	0.0	-
Positive half cycle	135.4	135.2	-0.2	± 0.0
Negative half cycle	135.4	135.2	-0.2	± 0.0

QP-TS12-04-04-02064

Cert. No. : ACL23088
Job No. : VC66AC0826
Pages : 1 of 8

Calibration Procedure : CPAC-01

Calibration Method :

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

For test results of each item were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Unit Date
Waveform Generator	33210A	MY48017079	IF-0007-22	04-Feb-23
Waveform Generator	335110	MY52302742	IF-0008-23	04-Feb-23
Digital Multimeter	33461A	MY53220194	EEL-BP-040205	09-Feb-23
Digital Multimeter	33461A	MY53220075	EEL-BP-040205	09-Feb-23
Digital Multimeter	24661A	MY60024273	EEL-BP-050205	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	IF-0009-23	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KM	34560495	AA-3003-22	22-Feb-23

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).

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)	Acceptance Limits
63	-0.1	± 0.0
125	0.0	± 0.0
250	0.0	± 0.0
500	0.0	± 0.0
1000	0.0	± 0.0
2000	0.0	± 0.0
4000	0.0	± 0.0
8000	0.0	± 0.0

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	± 0.2
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	± 0.1
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

QP-TS12-04-04-02064

Cert. No. : ACL23088
Job No. : VC66AC0826
Pages : 8 of 8

11. Overall indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.7	89.8	0.1
		+1.5

12. High level stability

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

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

End of Calibration Certificate

QP-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

431-4511 Sathorn Rd., Bangkok, Bangkok 10700 THAILAND
Tel: 0-2435-8800 Fax: 0-2435-1679 e-mail: center@sithiporn.com http://www.sithiporn.com



Cert. No.: ACL2232
Job No.: VC65AC0088
Pages: 1 of 8

Calibration Certificate

Equipment: SOUND LEVEL METER
Manufacturer: RION
Model: NL-42 Microphone UC-52 / Pre-amplifier N1-24
Serial No.: 0658492 / 15781 / 48096
ID No.: BKK, P5925

Condition As Found: GOOD

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

Location: -
Ambient Temperature: (23.0 ± 3) °C
Pressure: (101.3 ± 3) kPa
Relative Humidity: (50.0 ± 2.0) %
Received Date: 03 OCTOBER 2022
Calibration Date: 18-19 OCTOBER 2022
Date of Issue: 20 OCTOBER 2022

Calibrated by: Nattakorn Pitsanaporn

Approved by: T. Petchu
(Thanulak Petchu)

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QF-TS12-04-04-020604

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACL2232
Job No.: VC65AC0088
Pages: 2 of 8

Calibration Procedure: CP-AC-01

Calibration Method:

This equipment was calibrated by based on IEC-61672-2 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each items were made by observations 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	MY44017076	EF-0607-22	04-Feb-23
Waveform Generator	33511B	MY5202742	EF-0606-22	04-Feb-23
Digital Multimeter	33461A	MY51220104	EEL-30P-060205	09-Feb-23
Digital Multimeter	33461A	MY51220106	EEL-30P-05-0205	09-Feb-23
Digital Multimeter	34461A	MY60024277	EEL-30P-05-0205	09-Feb-23
Programmable Attenuator	MA1-1070	62100114	EF-0609-22	07-Feb-23
Condenser Microphone	4180	297900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA	34560495	AA-3009-22	22-Feb-23

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).

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACL2232
Job No.: VC65AC0088
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	✓	-	0.3	0.6
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	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For 4 kHz to 10 kHz	✓	-	0.3	0.7
For 10 kHz to 20 kHz	✓	-	0.3	0.7
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.7
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-weight level	✓	-	0.2	0.3
11. Overload indication	✓	-	0.2	0.3
12. High level stability	✓	-	0.1	0.1

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACL2232
Job No.: VC65AC0088
Pages: 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.10)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
17.3

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

Frequency Weighting	Measured value (dB)
A-weight	13.1
C-weight	19.0
Flat	24.7

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.3	0.3	0.4	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-0.5	-0.4	-0.4	±5.0

QF-TS12-04-04-020604

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACL2232
Job No.: VC65AC0088
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)			Acceptance Limits
	Flat	C-weight	A-weight	
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

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

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

6. Long-term stability

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

QF-TS12-04-04-020604

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACL2232
Job No.: VC65AC0088
Pages: 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.3
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	-0.1	±1.1
24.0	24.0	-0.1	±1.1
20.0	20.0	-0.1	±1.1
16.0	16.0	-0.1	±1.1
12.0	12.0	-0.1	±1.1
8.0	8.0	-0.1	±1.1
4.0	4.0	-0.1	±1.1

QF-TS12-04-04-020604

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACL2232
Job No.: VC65AC0088
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)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

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

10. Peak C-weight level

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	-
One	136.4	135.6	-0.8	±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	133.4	135.1	+1.7	±2.0
Negative half cycle	133.4	135.1	+1.7	±2.0

QF-TS12-04-04-020604

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACL2232
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

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

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

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

431-4511 Sathorn Rd., Bangkok, Bangkok 10700 THAILAND
Tel: 0-2435-8800 Fax: 0-2435-1679 e-mail: center@sithiporn.com http://www.sithiporn.com



Cert. No.: ACL2232
Job No.: VC65AC0088
Pages: 1 of 8

Calibration Certificate

Equipment: SOUND LEVEL METER
Manufacturer: RION
Model: NL-42 Microphone UC-52 / Pre-amplifier N1-24
Serial No.: 0295511 / 157112 / 87526
ID No.: BKK, P5968

Condition As Found: GOOD

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

Location: -
Ambient Temperature: (23.0 ± 3) °C
Pressure: (101.3 ± 3) kPa
Relative Humidity: (50.0 ± 2.0) %
Received Date: 17 JANUARY 2023
Calibration Date: 19-20 JANUARY 2023
Date of Issue: 23 JANUARY 2023

Calibrated by: Nattakorn Pitsanaporn

Approved by: T. Petchu
(Thanulak Petchu)

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

QF-TS12-04-04-020604

Continuation of Calibration Certificate

Cert. No. : ACL23049
Job No. : VC66AC0026
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

For test results of each item were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	ET-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	ET-0008-22	04-Feb-23
Digital Multimeter	34461A	MY53220104	EEL-IP-04/0263	09-Feb-23
Digital Multimeter	34461A	MY53220076	EEL-IP-03/0265	09-Feb-23
Digital Multimeter	34461A	MY6002273	EEL-IP-05/0265	09-Feb-23
Programmable Attenuator	MAF-107A	62100114	ET-0009-22	07-Feb-23
Conformer Microphone	4180	2977800	AA-18/1-23	34-Feb-23
Measuring Amplifier	NA-42KA1	3456695	AA-34/02-22	22-Feb-23

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).

QP-TS12-04-04-02004

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23049
Job No. : VC66AC0026
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

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	±0.2
C-weight	94.0	0.0	±0.2
Flat	94.0	0.0	±0.2

5.2 Time weightings at 1 kHz

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

6. Long-term stability

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

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T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23049
Job No. : VC66AC0026
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 limits of frequency weightings	✓	-	0.3	0.6
125 Hz	✓	-	0.3	0.6
3150 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings	✓	-	0.3	0.6
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	-	-	-	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	0.3
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QP-TS12-04-04-02004

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23049
Job No. : VC66AC0026
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.9	0.9	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	34.0	0.0	±1.1
29.0	29.9	0.9	±1.1
24.0	23.9	-0.1	±1.1
19.0	18.9	-0.1	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1

QP-TS12-04-04-02004

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23049
Job No. : VC66AC0026
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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.9)	93.9	0.0	±0.1

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

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

Frequency Weighting	Measured value (dB)
A-weight	9.9
C-weight	16.6
Flat	22.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-1.5	-1.5	-1.4	±5.0

QP-TS12-04-04-02004

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23049
Job No. : VC66AC0026
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8. Level linearity including the level range control

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

9. Tone burst response

Time Weighting	Time burst duration, T _b (ms)	Cycle	Anticipated Value (dB)				Measured Value (dB)				Deviated Value (dB)				Acceptance Limits (dB)			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Fast	0.25	8	108.0	107.9	0.0	1.5	107.9	107.9	0.0	1.5	107.9	107.9	0.0	1.5	107.9	107.9	0.0	1.5
			108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5
Slow	0.25	8	108.0	107.9	0.0	1.5	107.9	107.9	0.0	1.5	107.9	107.9	0.0	1.5	107.9	107.9	0.0	1.5
			108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5
SET	0.25	8	108.0	107.9	0.0	1.5	107.9	107.9	0.0	1.5	107.9	107.9	0.0	1.5	107.9	107.9	0.0	1.5
			108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5	108.0	108.0	0.0	1.5

10. Peak C sound level

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	±1.1
One	126.0	126.0	0.0	±1.1

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	±1.1
Positive half cycle	125.4	125.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QP-TS12-04-04-02004

T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL23049
Job No. : VC66AC0026
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11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate.

QP-TS12-04-04-02004

T. R. R.



Bara Scientific Co., Ltd.
968/10 Chu-Lung Building Floor 7, Rama 9 Road
Siam Bangkok, Thailand 10500
Tel: 02-6343000 Fax: 02-6375486-7
www.barscientific.com



Certificate of Calibration

Number of Page(s) : 1 of 3

Certificate No. BSCC-UV-38722
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A114549083320
ID No. BKC_FND018
Date of receipt 16 September 2022
Date of calibration 16 September 2022
Date of issue 21 September 2022

Customer name ALS Laboratory Group (Thailand) Co., Ltd.

Address 104 Soi Phrasamran 40, Phrasamran Road, Phrasamran, Sam-Luang, Bangkok 10260

Temperature (22 ± 0.3) °C (24 use)

Humidity (58 ± 0.3) % RH (24 use)

Equipment condition Good Operation

Calibration Location Organic Prep

Calibration Procedure In-house method: WU-VI-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 95017 and 95018
Photometric Accuracy is traceable to certificate No. 95020 and 95021
Slit Light is traceable to certificate No. 95020
The above certificates are traceable to SI unit through NIST Standard Reference Laboratory (NIST) (NIST accepted calibration laboratory NIST 6030)

Calibrated by WU-VI-702-01

REVIEW BY: *Suthe P.*
APPROVED BY: *W. A.*
NEXT CAL DATE: *16/9/23*

Approved by

Mr. Ratchit Choochit
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
According the report / Certificate and validity of the results are provided and also that will not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.

PMS-UV-002 Rev 01 (2019/05)



Bara Scientific Co., Ltd.
968/10 Chu-Lung Building Floor 7, Rama 9 Road
Siam Bangkok, Thailand 10500
Tel: 02-6343000 Fax: 02-6375486-7
www.barscientific.com



Certificate of Calibration

Number of Page(s) : 2 of 3

Certificate No. BSCC-UV-38722

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
241.70	0.0000	-0.06	0.16
334.02	0.0000	-0.10	0.16
418.33	0.0000	-0.07	0.16
572.96	0.0000	-0.03	0.16
678.41	0.0000	-0.24	0.16

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (A)
230	0.0000	0.0000	0.0000	0.0005
267	0.0000	0.0000	0.0000	0.0005
313	0.0000	0.0000	0.0000	0.0005
360	0.0000	0.0000	0.0000	0.0005
400	0.0000	0.0000	0.0000	0.0005

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
According the report / Certificate and validity of the results are provided and also that will not be reproduced
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PMS-UV-002 Rev 01 (2019/05)

Integrated Sample Introduction System (ISIS) Check

Purpose
This test demonstrates that the ISIS module is correctly installed and connected. It does not test module performance.

Setpoint	Observed Result	Expected Result	Status
Results			
Criteria			
As commanded, does the pump rotate?	Yes	Yes	Pass
As commanded, do the valves load and inject?	Yes	Yes	Pass
Setpoint Status:	Pass		Run: 1
Overall Integrated Sample Introduction System (ISIS) Check Test Status	Pass		

Date: June 14, 2022 10:32:16 AM
System ID: JF12091612

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Autotune

Purpose
This test uses baseline check standards to run a software-executed autotune in all modes. The tune report provides values for peak width, mass axis, sensitivity, oxide species, and doubly-charged species tests.

Setpoint	Observed Result	Expected Result	Status
Results			
Peakwidth Mass 7	0.735	AMU	
Agilent Recommended:	0.65		
Status:	Pass		
Peakwidth Mass 89	0.732	AMU	
Agilent Recommended:	0.65		
Status:	Pass		
Peakwidth Mass 205	0.746	AMU	
Agilent Recommended:	0.65		
Status:	Pass		
Mass Axis 7	7.00	AMU	
Agilent Recommended:	6.9		
Status:	Pass		
Mass Axis 89	89.03	AMU	
Agilent Recommended:	89.1		
Status:	Pass		
Mass Axis 205	205.00	AMU	
Agilent Recommended:	204.9		
Status:	Pass		

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Setpoint	Observed Result	Expected Result	Status
Results			
Mass 7 Sensitivity No Gas	81.18	Mps/pspm	
Agilent Recommended:	25.5		
Status:	Pass		
Mass 89 Sensitivity No Gas	247.81	Mps/pspm	
Agilent Recommended:	80		
Status:	Pass		
Mass 205 Sensitivity No Gas	184.87	Mps/pspm	
Agilent Recommended:	51		
Status:	Pass		
Mass 89 Sensitivity He	84.86	Mps/pspm	
Agilent Recommended:	25.4		
Status:	Pass		
Oxide Ratio 156/140	1.119	%	
Agilent Recommended:	1.38		
Status:	Pass		
Doubly Charged Species Ratio 70/140	1.140	%	
Agilent Recommended:	2.3		
Status:	Pass		
Setpoint Status:	Pass		Run: 1
Overall Autotune Test Status	Pass		

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Background (No Gas Mode)

Purpose
This test examines the background of the ICP-MS in no gas mode by monitoring ions during a blank run.

Setpoint	Observed Result	Expected Result	Status
Conditions			
Masses:	7	AMU	
	89	AMU	
	205	AMU	
Measurements and Results			
Measured Value:	7	89	205
Agilent Recommended:	4.800	7.100	16.400
Status:	Pass	Pass	Pass
Setpoint Status:	Pass		Run: 1
Overall Background (No Gas Mode) Test Status	Pass		

Date: June 14, 2022 10:32:16 AM
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Background (Gas Mode)

Purpose
This test examines the background of the ICP-MS in the various gas modes by monitoring ions during a blank run.

Setpoint	Observed Result	Expected Result	Status
Conditions			
Gas Mode:	Thallium		
Mass:	78	AMU	
Integration Time:	1.0	sec	
Cycles:	20		
Measurements and Results			
Mass (AMU):	78		
Measured Value:	21.1000	OR	
Agilent Recommended:	4.60		
Status:	Pass		
Setpoint Status:	Pass		Run: 1
Overall Background (Gas Mode) Test Status	Pass		

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20-Minute Stability (No Gas Mode)

Purpose
This test monitors the abundance of ions present in the checked standard over a 20-minute period to verify that the signal is stable. The %RSD of the abundance of given ions is calculated internally by the software and compared to the limit.

Setpoint	Observed Result	Expected Result	Status
Conditions			
Mode:	Spectrum		
Masses:	7, 9, 89, 140, 205		
Integration Time:	9.99	sec	
Peak Pattern:	3	points/peak	
Repetitions:	20		
Swaps/Replicates:	100		
Measurements and Results			
Masses (AMU):	7	89	205
Stability RSD:	0.2	0.6	0.8
Agilent Recommended:	3.45	3.45	3.45
Status:	Pass	Pass	Pass
Setpoint Status:	Pass		Run: 1
Overall 20-Minute Stability (No Gas Mode) Test Status	Pass		

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Declaration of Change Control

This document is under change control. Revision history is maintained and printed on each document. Access to the master documents is limited to process owners. Documents receive periodic review and cannot be assigned an overgrown status. The qualification performed according to this document refers only to the hardware/software configuration in place at the time of the qualification. Agilent Technologies recommends that instrument configuration change management procedures be in place in order to maintain the validation process. Any changes to the analytical or computer hardware or software must be clearly specified. A change management system provides a means for determining the degree of requalification required according to the extent of the changes made. All details of the changes must be thoroughly recorded and documented, together with details of completed tests and their results. Note: Hardware/software configuration management is the customer's responsibility.

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Attachments

Training requirements note: The delivery engineer attaches an ACE technique-specific training certificate to the Equipment Qualification Report (EQR). Obtaining ACE technique-specific certification includes pre-requisite trainings for Data Integrity, General Compliance topics (GMP, GLP, ALCOA, etc.), instrument hardware and software components, and the ACE technique itself. The one certificate encompasses all pre-requisite trainings as documented in the Agilent Learning Management System called Success Factors.

Location	Category	Document Name	Page
EQR	General	Certificate of System Qualification	17
EQR	General	Operator's training certificate and qualifications	18
EQR	General	Certificate of Qualification for ACE	19
EQR	General	Certificate of Qualification for ACE	20
EQR	General	Tune Reports	21
EQR	General	Test Report	24
EQR	General	Test Report	25

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Document Name: Certificate of System Qualification

Agilent Technologies

Agilent Compliance Engine Self Qualification

Date: September 14, 2021 4:09:12 PM
Area: Berlin, Germany
Platform: Windows
ACE 3.11

Individual and qualification reports for each specific technique installed are also available upon request. They provide additional details on the general report from the service survey and are structured by the actual algorithms installed during the process. There is no automatic installation of these algorithms and/or programs from service team unless they are used by service team and across multiple similar hardware components of the qualified systems.

Technique Type	Tests Completed	Result
Atomic Absorption	7	Confirms
Capillary Electrophoresis	10	Confirms
Distillation	6	Confirms
Emission Spectrometry	2	Confirms
Gas Chromatography - GC/MS	17	Confirms
Gas Chromatography	20	Confirms
Gas Permeation Chromatography	8	Confirms
ICP-MS	6	Confirms
Infrared Spectrometry	7	Confirms
Liquid Chromatography	17	Confirms
Liquid Chromatography - LC/MS	6	Confirms
Mass/MS/MS	10	Confirms
Sample Preparation - Gas Chromatography	9	Confirms
Sample Preparation - Liquid Chromatography	8	Confirms
Supercritical Fluid Chromatography	10	Confirms
Software	6	Confirms
UV-Vis Spectrophotometer	10	Confirms
Overall Qualification Status		Confirms

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System ID: JF12091612

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Document Name: Test Report

Batch Summary Report									
Sample Name	7-17p-SM1	7-17p-SM2	7-17p-SM3	7-17p-SM4	7-17p-SM5	7-17p-SM6	7-17p-SM7	7-17p-SM8	7-17p-SM9
Batch	20210614	20210614	20210614	20210614	20210614	20210614	20210614	20210614	20210614
Sample Name	7-17p-SM1	7-17p-SM2	7-17p-SM3	7-17p-SM4	7-17p-SM5	7-17p-SM6	7-17p-SM7	7-17p-SM8	7-17p-SM9
Batch	20210614	20210614	20210614	20210614	20210614	20210614	20210614	20210614	20210614

Page 3/7 8/4/2022 10:00 AM

Date: June 14, 2022 10:52:16 AM
System ID: JP12091912
Page 27/30

User Name: jacobus_karrachats Accession: A880470101				System ID: 27398191 Print Date: Thu, 14, 2023 10:50:29 AM		
ALC-024477357735-110232 Transaction History:						
No.	Transaction Date	Activity Performed	Type of Transaction	Optional Information		
	June 14, 2023 10:24:44 AM Start	Execution	Background (No Gen Mode) CDSW/1, No Gen Mode Background 1	None		
	June 14, 2023 10:32:40 AM End	Execution	Background (No Gen Mode) CDSW/1, No Gen Mode Background 1	Run Count: 1		
	June 14, 2023 10:32:40 AM Start	Execution	Background (No Gen Mode) CDSW/1, One Minute Background/1 (Wait)	None		
	June 14, 2023 10:33:05 AM End	Execution	Background (No Gen Mode) CDSW/1, One Minute Background/1 (Wait)	Run Count: 1		
	June 14, 2023 10:33:07 AM Start	Execution	30-Minute Stability (No Gen Mode) CDSW/1, 30-Minute Stability (No Gen Mode) 1	None		
	June 14, 2023 10:34:28 AM End	Execution	30-Minute Stability (No Gen Mode) CDSW/1, 30-Minute Stability (No Gen Mode) 1	Run Count: 1		
	June 14, 2023 10:34:28 AM Start	Queueing	Session	OQ		
	June 14, 2023 10:34:48 AM Start	Reporting	Session	None		
	June 14, 2023 10:35:28 AM Audit	Reporting	Session	Report Generated: 1		
	June 14, 2023 10:35:38 AM Audit	Reporting	Session	Report Generated: 1, Report		

Page 1 of 2

Page 3/7 8/4/2022 10:00 AM

Date: June 14, 2022 10:52:16 AM
System ID: JP12091912
Page 30/30

Instrument Details

Purpose
This section describes the as found system configuration.

Details	
ICPMS 1	
Manufacturer	Agilent Technologies
Name	7700x
Model Number	G3281A
Detector Type	SG
Nebulizer	Mist Mat (G3161)
Spray Chamber	Quartz
Torch	Quartz
Sampling Cone	NI
Skimmer Cone	NI
Serial Number	JP12091912
Firmware Revision	D.01.01
ISIS 1	
Manufacturer	Agilent Technologies
Name	ISIS2
Model Number	G4911A
Installed Options	8002: 2 pumps, 1 valve, auto dilution and discrete sampling
Type	Pendulum pump system
Autosampler 1	
Manufacturer	Agilent Technologies
Name	ASX-520
Model Number	G3285A
Serial Number	031403A020
Chiller 1	
Manufacturer	Agilent Technologies
Name	Chiller
Model Number	G3292A
Serial Number	4N1220700

Date: June 14, 2022 10:52:16 AM
System ID: JP12091912
Page 3/7

Electronic Signature

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

Details
Full Name of Signer: Panchap Kurusethan
Logged On User Name: panchap_kurusethan@agilent.com
Signature Creation Date: June 14, 2022
Reason for Signature: Executed protocol and published this original version of document

Regulatory Disclaimer
This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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

Date: June 14, 2022 10:52:16 AM
System ID: JP12091912
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Certificate of System Qualification

System ID: JP12091912
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 108 Phatthanasarn 40, Suan Luang, Bangkok 10250 Thailand.

Date: June 14, 2022 10:52:51 AM
EQP Name: Agilent Recommended
EQP Revision: ICPMS G2 50
Overall Qualification Status: Pass

Autosampler Check

Overall Autosampler Check Test Status
Pass

Integrated Sample Introduction System (ISIS) Check

Overall Integrated Sample Introduction System (ISIS) Check Test Status
Pass

Autotune	Pass
PeakWidth Mass 7	Pass
PeakWidth Mass 89	Pass
PeakWidth Mass 205	Pass
Mass And 7	Pass
Mass And 89	Pass
Mass And 205	Pass
Mass 7 Sensitivity No Gas	Pass
Mass 89 Sensitivity No Gas	Pass
Mass 205 Sensitivity No Gas	Pass
Mass 59 Sensitivity No Gas	Pass
Oxide Ratio 150/140	Pass
Doubly Charged Species Ratio 70/140	Pass

Overall Autotune Test Status

Pass

Date: June 14, 2022 10:52:51 AM
System ID: JP12091912
Page 1/7

Source Name: Batch: Transaction Info:				System Info: JP1001103	
Database: ASB000001133				Print Date: 2022 10 30 20 AM	
A/C EQP / I/O / VAL / OED Transaction Log:					
Time	Transaction Date	Activity Performed	Type of Transaction	Optional Information	
June 14, 2022 10:14:01 AM		Accountant	Session	None	
June 14, 2022 10:14:01 AM		Configuration	Session	None	
June 14, 2022 10:14:01 AM		EndSession	Session	User is ProfileEngineer and does not require an update code	
June 14, 2022 10:18:18 AM		EqpLoaded	Session	EQP check for primary Accountant Profile - ProfileID (ProcessProfileName/Config extended) ID:000001333 eqp, EQP File Name: (Batch ID, User, and systemComment)	
June 14, 2022 10:18:20 AM		Configuration	Session	None	
June 14, 2022 10:18:20 AM		Configuration	Session	OO	
June 14, 2022 10:18:20 AM		Session	Accountant/ Check	ASB-0001	None
June 14, 2022 10:18:40 AM		Session	Accountant/ Check	ASB-0001	Run Count: 1
June 14, 2022 10:18:40 AM		Session	Integrated Sample Introduction	None	None
June 14, 2022 10:18:40 AM		Session	Integrated Sample Introduction	None	None
June 14, 2022 10:18:47 AM		Session	Integrated Sample Introduction	None	Run Count: 1
June 14, 2022 10:18:47 AM		Session	System (OED) Check - (OED)	Integrated Sample Introduction	System (OED) Check
June 14, 2022 10:18:48 AM		Session	Accountant (OED) Account 1	None	None
June 14, 2022 10:19:02 AM		Session	Accountant (OED) Account 1	None	None

Page 1 / 2

Page 3/7 8/4/2022 10:00 AM

Date: June 14, 2022 10:52:16 AM
System ID: JP12091912
Page 29/30

Background (No Gas Mode)									
Setpoint Status:	Pass								
Mass (AMU):	7		89		205				
Measured Value:	4,900		7,100		18,400				
Agilent Recommended:	≤ 10		≤ 10		≤ 30				
Status:	Pass		Pass		Pass				
Overall Background (No Gas Mode) Test Status									
Pass									
Background (Gas Mode)									
Gas Mode:	Helium								
Setpoint Status:	Pass								
Mass (AMU):	79								
Measured Value:	21,100		cps						
Agilent Recommended:	≤ 400								
Status:	Pass								
Overall Background (Gas Mode) Test Status									
Pass									
20-Minute Stability (No Gas Mode)									
Masses (AMU):	7		89		205				
Stability RMS:	0.2		0.6		0.8				
Agilent Recommended:	≤ 3.65		≤ 3.65		≤ 3.65				
Status:	Pass		Pass		Pass				

Page 3/7 8/4/2022 10:00 AM

Date: June 14, 2022 10:52:51 AM
System ID: JP12091912
Page 2/7

Batch Name: pathway_keratinocytes				Batch ID: JF_20210614	
Reference: A03849301013				Print Date: 04/10/2022 10:02:00	
ALC GSEXP / 100 14.04.2022 Transfection log:					
Time	Transfection Date	Activity Performed	Type of Transfection	Optional Information	
June 14, 2022 10:14:43 AM Auct	Seascan/Control	Seascan	Seascan	None	
June 14, 2022 10:15:43 AM Seas	Configurations	Seascan	None	None	
June 14, 2022 10:16:43 AM Auct	Endstream	Learning	None	None x 10000000 and none not require an output code	
June 14, 2022 10:18:43 AM Auct	Explicated	Seascan	None	GSP activity for primary techniques (path): - Path [Process:Seascan/Control]Confid entent:0.000000,0.000000	

Page 3/7 8/4/2022 10:00 AM

Date: June 14, 2022 10:52:51 AM
System ID: JP12091912
Page 5/7

Certificate No. T221644

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 30 June - 1 July 2022
Environment : Temperature : 18.9-23.7 °C
Line Voltage : 222.9-226.5 V
Relative Humidity : 55-65 %RH

Condition of this result of calibration :

- This equipment was calibrated by insert nine standard thermocouples type T into in chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in accordance to NIST-720 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986). All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS-90.
- Reference Standard Instrument :
Instrument Model Instrument No. Certificate No. Due Date
TC TYPE T TN161-TN170 T210009 30 July 2022
TC TYPE T TN171-TN180 T210009 30 July 2022
DATA LOGGER 3479A T149 T210009 30 July 2022
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244).
- Condition of calibrated item : good
Equipment Description :
Time Constant 3 Hour Minute At 3 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Not Available
- Adjustment :
() without adjustment (X) after adjustment

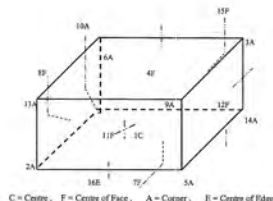
Approved By:

FM-15-11315-09-63

Certificate No. T221644

Page 3 of 4

Calibration Report



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

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

Approved By:

FM-15-11315-09-63

Certificate No. T221644

Page 4 of 4

Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)							
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168
3	2.71	2.82	2.75	2.89	2.95	3.68	3.02	2.96
	TN171	TN172	TN173	TN174	TN175	TN176		
	2.97	3.02	2.89	3.04	2.97	3.33		

Temp (°C)	Chamber (Cold Room)		Temperature Distribution				
	Reading (°C)		Average (°C)		Stability (°C)	Uniformity (°C)	Coverage
	Min, Max	Average	Average (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)	Factor 4
3.0	2.9, 4.0	3.2	2.91	1.85	1.30	1.66	2.00

* The quoted accuracy exclude "uniformity".

The calibration result apply only the above calibrated item.

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

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

Approved By:

FM-15-11315-09-63



Performance Verification Certificate

for Mercury Analyzer

Product ID : Quicktrace M-8000, Teledyne Leeman Labs

Equipment ID : BKK_ELB128 Mercury Analyzer
S/N: US22133002BKK_ELB129 Autosampler
S/N: 052222A540Customer Name : ALS Laboratory Group (Thailand) Co., Ltd.
Address : 104 Suk Phatana 40, Pattana Rd, Suan Luang, Suan Luang
Bangkok 10250 ThailandDate of Qualified : November 30, 2022
Next Due date : November 30, 2023

This certifies for products which was performed in acceptable criteria specifications

Autosampler & Sample Introduction	PASSED
Analyzer	PASSED
Gas Liquid Separator & Dryer	PASSED
CVPS Detector	PASSED
Electronics/Mechanical	PASSED
Data station/PC	PASSED
Analytical test	PASSED

Provided by

Scientist Instrument Co., Ltd.
113 No 15 Sukhvit 44, Bancha Road
Klong Kong Place, Bangkok
Bangkok 10130 ThailandCertified by:
Thunaphon Sakdyan
Service EngineerREVIEW BY: P. Srisangman
APPROVED BY:
NEXT CAL DATE: 30/11/23TECHNOLOGY PROMOTION ASSOCIATION (THAILAND) JAPAN
CHRONOMETER SERVICE & EQUIPMENT CALIBRATION AND TESTING SERVICE
114/1 PATTANAKARN ROAD (KOR) 10, SUKHVIT 44, BANGKOK 10110, THAILAND
TEL: 02-717-1000-27 FAX: 02-717-1000-28

Certificate of Calibration

Cert. No.: 22TM176
Page: 1 of 3

Equipment : Autoclave

Manufacturer : TOMY

Model : SX-700

Serial No. : 48134190

ID No. : EKH_ML0041

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

104 Phatthanakan Rd., Phatthanakan Rd.,

Klongkong Phatthanakan, Klongkong Phatthanakan,

Bangkok 10250 Thailand

Media Preparation Room

Location :

Received Order :

Calibration Date :

Ambient Temperature :

Relative Humidity :

Calibrated by :

Approved by :

Issue Date :

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

This certificate was prepared by the company and is not valid without the company's seal.

Approved by the company and is not valid without the company's seal.

REVIEW BY:
APPROVED BY:
NEXT CAL DATE: 30/11/23

A 0041435

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND) JAPAN
CHRONOMETER SERVICE & EQUIPMENT CALIBRATION AND TESTING SERVICE
114/1 PATTANAKARN ROAD (KOR) 10, SUKHVIT 44, BANGKOK 10110, THAILAND
TEL: 02-717-1000-27 FAX: 02-717-1000-28

Certificate of Calibration

Cert. No.: 22TM176
Page: 2 of 3

Equipment : Autoclave

Condition As-Received : Used Item

Reference : 2205-0400C-2

Procedure Used :

Calibration was conducted using in-house calibration procedure CP-OT03 according to direct

measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

Condition of this result of calibration :

1. Reference standard instrument:

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

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which

could be infected with organisms categorized as Hazard Group 1, 2 and 3**

(**) = Contamination of pathogens according to hazard and categories of containment, second edition, 1990

It does not cover autoclaves for use with material infected with organisms in Hazard Group 4, for which

complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical

or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected

to sterilization which are required to be dry at the end of cycle.

Result of Calibration : () Without Adjustment

Function of UUC* : Temperature Source

Environmental

Beginning of Calibration : 25 °C

Finished of Calibration : 25 °C

Position : 1 = Center of chamber

2 = Temperature sensor

3 = Exhaust port

Ref. Std. ID No. : 15-17TC-11

15-17TC-12

15-17TC-13

a 1109670



Equipment : Autoclave

Condition As-Received : Used Item

Reference : 2205-0400C-2

Result of Calibration : () Without Adjustment

Operating parameter Set : Temperature = 120 °C

Sterilization period = 10 minutes

UUC* : 1

UUC* : 1

UUC* : 1

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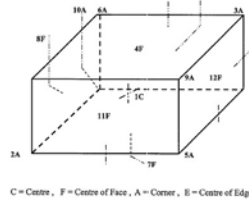
UUC* : 1

Equipment : Chamber (Incubator)
Date of Calibration : 5 April 2023 (Finished Time 4:30 PM)
Environment : Temperature 22.9-28.6 °C
Line Voltage 221.7-225.5 V

- Condition of this result of test :
- This instrument was calibrated by insert 12 standard resistance thermometer into its chamber and test according to W9-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986.)
All data show below were final values and the initial data may be obtained upon request.
The temperature scale used was based on ITS - 90.
 - Reference Standard Instrument :
Instrument Model Instrument No. Certificate No. Due Date
RTD 100 ohm 37-(CHI)-10 T222493 28 November 2023
RTD 100 ohm 36-(CHI)-10 T222493 28 November 2023
DATA LOGGER 34970A T193 T222493 28 November 2023
 - This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TS 17025 CALIBRATION 0244.)
 - Condition of calibrated item : good
UUC Description :
Time Constant 1 Hour 37 Minute At 20 °C
Fresh Air Dumper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close ☐ Not Available
 - Result of test :
() without adjustment (X) after adjustment

Approved By: [Signature]

PM-L12 17115-05-43



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

1C = 37CH1	11F = 36CH1
2A = 37CH2	12F = 36CH2
3A = 37CH3	
4F = 37CH4	
5A = 37CH5	
6A = 37CH6	
7F = 37CH7	
8F = 37CH8	
9A = 37CH9	
10A = 37CH10	

Approved By: [Signature]

PM-L12 17115-05-43

Measurement Results										
Average Standard Reading at each position (°C)										
Calibration Point	37CH1	37CH2	37CH3	37CH4	37CH5	37CH6	37CH7	37CH8	37CH9	37CH10
20.0	20.26	20.17	20.10	20.15	20.12	19.96	20.14	19.69	20.20	19.82
	36CH1	36CH2								
	20.03	20.04								

Chamber (Incubator)		Temperature Distribution					
Setting (°C)	Reading (°C)	Average (°C)		Stability (°C)	Uniformity (°C)	Uncertainty (°C)	Coverage Factor k
	Min, Max	Average					
20.0	19.9, 20.1	20.0	19.98	0.19	0.53	0.38	2.00

* The quoted uncertainty exclude "uniformity"
The calibration result apply only the above calibrated item.
The result of test was found accurate as shown on date and place of test only.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By: [Signature]

PM-L12 17115-05-43

Certificate of Calibration

Equipment : Burette
Capacity : 50 mL
Serial No. :
ID No. : BKK_EN0171
Manufacturer : Wittig
Made in : Germany
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan Rd., Phatthanakan Rd.,
Khuang Phatthanakan, Khet Suan Luang
Bangkok 10250 Thailand
Ambient Temperature : 20 ± 2.5 °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 759 mmHg
Calibration Procedure : ASTM E 542 - 01
Calibrated by : Parnard Pramkarn
Approved by : [Signature]
() Ponthippa Tameyakul
() Maithe Butnane
() Parnan Parnan
() Sriuda Khamtha
Issue Date : 31 August 2022

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

A 0044607

Equipment : Burette
Received Date : 28 August 2022
Condition As-Received : Used Item
Calibration Date : 30 August 2022
Reference : 2208-09180SC-2
Cert.No.: 22C03154
Page: 2 of 2

Condition of this result of calibration

- Reference Standard Instruments :
Instruments Model Serial No. ID No. Certificate No. Traceability Due date
1) Balance AE2005 N3079 140RC001 21MM429 NIST NIMT 22 Sep 2022
2) Thermo-Hygrograph TH01C 00016540 140EC001 22H1243 NIST NIMT 09 June 2023
3) Thermometer 1594592 140EC010 22H181 NIMT 10 Feb 2023
This certification is traceable to SI Unit
- The certificate is valid only to the item calibrated on date and place of calibration.
- True value is converted to true volume at the standard temperature of 20 °C

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
50	49.9959	0.010	2.00

Remark mL = cm³
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 % .
-000-

a 1123908

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven Compact S220
Serial No. : B502946426
ID No. : BKK_EN0072
Condition As-Received : Used Item
Received Date : 09 September 2022
Calibration Date : 12 September 2022
Reference : 2209-03120SC-1
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan Rd., Phatthanakan Rd.,
Khuang Phatthanakan, Khet Suan Luang
Bangkok 10250 Thailand
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CMS by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
Calibrated by : Warakorn Lemgtrakul
Approved by : [Signature]
() Maithe Butnane
() Sathit Meangmai
() Warakorn Lemgtrakul
Issue Date : 15 September 2022

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

Condition of this calibration result
1. Reference Standard Instrument :
Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 54030049 130RC116 22E2789 24 Aug 2023
This certification is traceable to the International System of Unit maintained at :
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835
Buffer Solution Manufacturer Lot No. Exp. date
pH 4.008 CPA chem 823320 20 June 2024
pH 6.985 CPA chem 794122 14 Feb 2023
pH 10.008 CPA chem 823323 20 June 2023

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

Calibration Results						
Function : mV Measurement						
Performing standard curve by Fluke at pH (4.7,10)						
Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
			mV	pH		
pH Meter SN: B502946426	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Function : pH Measurement					
Performing three buffers standard curve by using buffer nominal pH (4.7, 10)					
Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (pH)	Coverage factor k
pH Electrode	4.008	3.999	153.9	0.0095	2.09
SN: PCE-88-EX1001	6.985	7.017	-13.7	0.0094	2.00
	10.008	9.998	-178.0	0.0078	2.06

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 % .
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เดือน	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
130												

Periodical maintenance check list for Konelab

	6M	12M	Notel
1.Diluent-wash tubing change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.256 tubing change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3.Syringe check/change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.Dispensing check/ change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5.Waste tubing change when necessary	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6.Lamp check/change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7.Axial paddle/jackle change(not Konelab20)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8.256 needles check/change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9.Pump tubing check/ change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10.Broken/vorn out part check /change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11.Peristaltic pump check /clearing/ lubrication	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12.Heating check	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13.Cooling check	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
14.Dispenser mechanic check/adjustment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
15.Ovenette transfer mechanic check/adjustment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
16.Dispenser movement check/adjustment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
17.Sample/reagent register check/adjustment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
18.Dispensing tubing tightness check	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
19.Photometer and optics cleaning/check/adjustment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
20.Workstation PC clearing if necessary	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
21.Mechanic cleaning/lubrication	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
22.Instrument clearing if necessary	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
23.Complete analyzer testing with waterblank/QC or sample	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
24.Test parameters/Adjustment/config. Save to USB key	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
25.UPS Test	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Place: RS Laboratory Instrument: Kva Agilent 250
Date/Time: 05-01-66 Serial no: 09981
Service done by: P. P. P. Install date:
Signature of customer: P. P. P. Date/Time:

Certificate of Calibration

Equipment : HOT BLOCK
Manufacturer : Environmental Express
Model : B3000-240
Serial No. : 2017CODW116
Customer Code : BKK_EN0222
ID No. : T6769A4
Customer : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khuang Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Wet Chemistry Lab2
Date of Receipt : 21 April 2023
Calibrated By : Watcharak Pottarat (Technician)
Approved By : [Signature] / Sujjar Naknakred (Site Calibration Manager)
Date of Issue : 12 MAY 2023

The uncertainties are for a confidence probability of approximately 95%.
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

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WALTON

Certificate of Calibration

Equipment : Liquid Bath (Water)
Manufacturer : MEMMERT

Model: WNB29
Serial No.: L6110135

Customer Code : HKK_EN0148
ID No. : T6455A4
Customer : A.I.S Laboratory Group (Thailand) Co., Ltd.

104 Phatthanasukan 46, Phatthanasukan Rd., Klongroeng Phatthanasukan,
Khet Suon Lunag, Bangkok 10250

Customer Location : ORGANIC PREPARATION LAB
Date of Receipt : 16 January 2022

Calibrated By : Watcharapon Sangtong (Technician)
Approved By : / Sujjar Nakhakred (Site Calibration Manager)
Date of Issue : 08 FEB 2022

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its compliance to recognized national standards and is the unit of measurement realized at the corresponding national standard laboratory. This certificate is

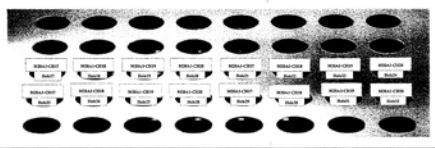
DOI: 10.1017/S002229240000244



Certificate No. T230992

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Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD:	Position of Standards at Block							
$^{\circ}\text{C}$	$^{\circ}\text{C}$	$^{\circ}\text{C}$	Reading	Block17	Block18	Block19	Block20	Block21	Block22	Block23	Block24
380.0	380.0	378.4 - 380.7	Max $^{\circ}\text{C}$	378.6	380.1	380.1	380.0	379.1	379.8	379.6	377.8
			Min $^{\circ}\text{C}$	377.8	378.6	379.7	379.3	378.8	379.2	379.2	377.3
			Average $^{\circ}\text{C}$	378.1	379.8	379.9	379.7	378.9	379.6	379.4	377.6
			Stability $^{\circ}\text{C}$	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.2

Cal. Point	Setting	Reading	STD:	Position of Standards at Block							
$^{\circ}\text{C}$	$^{\circ}\text{C}$	$^{\circ}\text{C}$	Reading	Block25	Block26	Block27	Block28	Block29	Block30	Block31	Block32
380.0	380.0	378.4 - 380.7	Max $^{\circ}\text{C}$	377.9	378.6	380.1	380.1	379.3	379.6	379.8	377.3
			Min $^{\circ}\text{C}$	377.8	378.0	379.7	379.2	378.8	379.3	379.4	376.7
			Average $^{\circ}\text{C}$	377.7	378.2	379.9	379.9	379.0	379.3	379.6	377.0
			Stability $^{\circ}\text{C}$	0.3	0.3	0.2	0.2	0.3	0.4	0.3	0.3

Approved By:

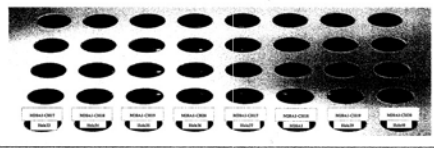
PM4.13 EN/30-05-17



Certificate No. T230992

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Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD:	Position of Standards at Block							
$^{\circ}\text{C}$	$^{\circ}\text{C}$	$^{\circ}\text{C}$	Reading	Block33	Block34	Block35	Block36	Block37	Block38	Block39	Block40
380.0	380.0	378.4 - 380.7	Max $^{\circ}\text{C}$	377.7	378.0	379.3	379.0	378.2	378.2	377.3	377.4
			Min $^{\circ}\text{C}$	377.3	377.6	377.9	378.0	377.7	378.1	376.9	377.0
			Average $^{\circ}\text{C}$	377.5	377.8	378.1	378.8	378.8	378.3	377.1	377.2
			Stability $^{\circ}\text{C}$	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

The expanded uncertainty of temperature measurement was $\pm 1.85^{\circ}\text{C}$

The calibration result apply only the above calibrated item.

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

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

Approved By:

PM4.13 EN/30-05-17