

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

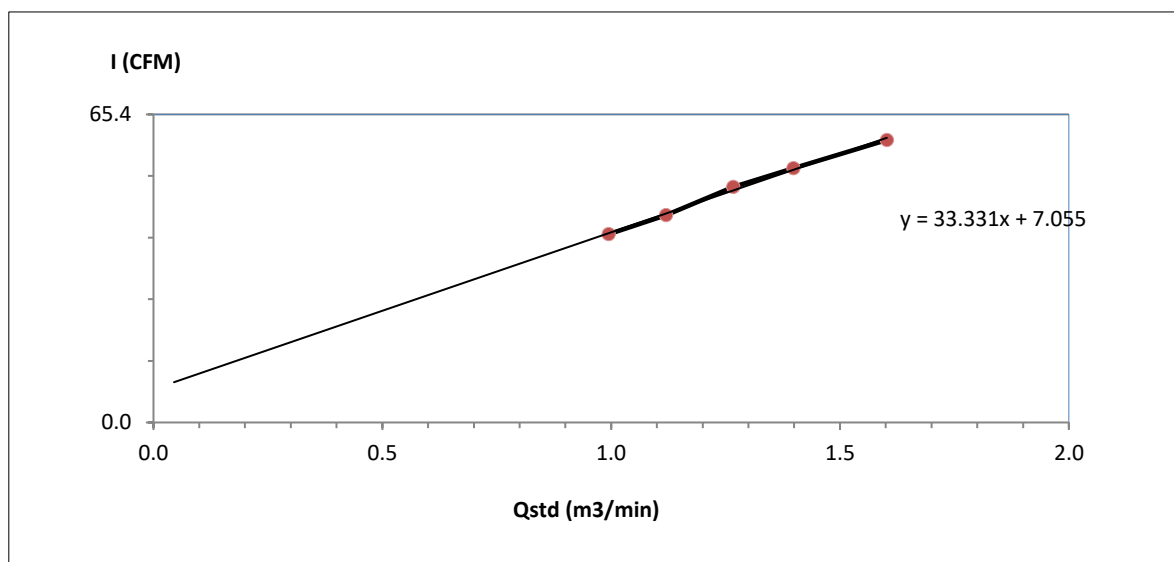
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Total Suspended Particulate	High Volume	RYG_FS0173	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	23-Mar-22	23-Mar-23	12
Ambient	Chlorine	Field Rotameter	RYG_FS0198	1-Oct-22	1-Jan-23	3
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0085	8-Oct-21	8-Apr-23	18
Stack	Chlorine	Console Control Unit	RYG_FS0315	12-Jul-22	12-Jan-23	6
Stack	Chlorine	Dry Gas	RYG_FS0317	12-Jul-22	12-Jan-23	6
Stack	Chlorine	Ion Chromatography	BKK_EN0069	12-Jan-22	12-Jan-23	12
Stack	Total Suspended Particulate	Console Control Unit	RYG_FS0315	12-Jul-22	12-Jan-23	6
Stack	Total Suspended Particulate	Digital Balance	RYG_EN0003	23-Mar-22	23-Mar-23	12
Stack (CEMs)	Chlorine	CEMs Data	-	-	-	-
Workplace	Chlorine	Field Rotameter	RYG_FS0198	1-Jul-22	1-Oct-22	3
Workplace	Chlorine	Field Rotameter	RYG_FS0198	1-Oct-22	1-Jan-23	3
Workplace	Total Dust	Field Rotameter	RYG_FS0198	1-Jul-22	1-Oct-22	3
Workplace	Total Dust	Field Rotameter	RYG_FS0198	1-Oct-22	1-Jan-23	3
Workplace	Total Dust	Digital Balance	RYG_EN0004	23-Mar-22	23-Mar-23	12
Workplace	Respirable Dust	Field Rotameter	RYG_FS0198	1-Jul-22	1-Oct-22	3
Workplace	Respirable Dust	Field Rotameter	RYG_FS0198	1-Oct-22	1-Jan-23	3
Workplace	Respirable Dust	Digital Balance	RYG_EN0004	23-Mar-22	23-Mar-23	12
Noise	Leq 12 hrs	Sound Calibrator	RYG_FS0213	26-Apr-22	26-Apr-23	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0012	4-Oct-21	4-Oct-22	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0015	24-May-22	24-May-23	12
Noise	Leq 12 hrs	Sound Calibrator	RYG_FS0496	10-Jan-22	10-Jan-23	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0438	7-Sep-22	7-Sep-23	12
Noise	Leq 12 hrs	Sound Level Meter	RYG_FS0439	7-Sep-22	7-Sep-23	12
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0496	10-Jan-22	10-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0492	10-Jan-22	10-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0491	10-Jan-22	10-Jan-23	12
Noise	Leq 5 min	Sound Calibrator	RYG_FS0496	10-Jan-22	10-Jan-23	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0491	10-Jan-22	10-Jan-23	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_FS0212	1-Dec-21	1-Dec-22	12
Rayong Lab	pH at 25 oC	pH meter	RYG_EN0183	17-Mar-22	17-Mar-23	12
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	14-Feb-22	15-Aug-23	18
Rayong Lab	BOD	Incubator	RYG_EN0154	22-Apr-22	21-Oct-23	18
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	27-Sep-22	27-Mar-24	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Suspended Solids	Chamber Oven	RYG_EN0010	20-Oct-22	20-Apr-24	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Dissolved Solids 180°C	Chamber Oven	RYG_EN0010	20-Oct-22	20-Apr-24	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Oil & Grease	Chamber Oven	RYG_EN0006	20-Oct-22	20-Apr-24	18
Rayong Lab	Oil & Grease	Water Bath	RYG_EN0061	20-Oct-22	20-Apr-24	18
Rayong Lab	Temperature	pH Meter	RYG_FS0420	14-Mar-22	14-Mar-23	12
Soil	pH aqueous phase 50% (w/v)	pH meter	BKK_EN0072	12-Sep-22	12-Mar-24	18





High Volume Air Sampler Calibration Worksheet

Project Site :	S and L Specialty Polymers Co., Ltd.	Barometric Pressure (mm Hg) :	758
Calibrate Location :	ศูนย์พัฒนาฝีมือแรงงาน จ. ระยอง (A3)	Temperature (°C) :	30
Calibrate Date :	17-Oct-22	High Volume ID :	RYG_FS0173
CalibrationSheet No.:	C-171022-RYG_FS0173	High Volume Model :	TE-5170D
Calibrator ID:	RYG_FS0205	High Volume S/N :	4799
Calibrator Model :	TE-5028A	Calibrator Slope :	1.50765
Calibrator S/N :	1166	Calibrator Intercept :	-0.02043

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.2	0.9948	40	Slope : 33.3310 Intercept : 7.0550 Correlation Coefficient : 0.9979
2	2.8	1.1197	44	
3	3.6	1.2668	50	
4	4.4	1.3984	54	
5	5.8	1.6025	60	



Calibrated by 
(Mr.jakkarin manwicha)
Field Scientist(1)

Approved by : 
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



PENTA
CALIBRATION

PENTA CALIBRATION CO., LTD.

66/124 The Connect 33 Village Kanchanaphisek Road
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www.pentacal.com

Certificate of Calibration

Represent to Certificate of Calibration ,PTC/07/22102

Certificate No.:	PTC/07/22102	Page:	1 of 2
Equipment:	Digital Balance	Condition:	Normal
Manufacturer:	Sartorius	Serial No:	25409664
Model:	LA130S-F	ID No:	RYG_EN0001
Type of Balance:	Single interval		



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



Environment Condition: Temperature 23.9 °C ± 0.3 °C
Humidity 58.1 %RH ± 4.4 %RH
Air density 1.17 kg/m³

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

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd.
, NSC-ONSC Accreditation No.: Calibration 0189

Date Received: March 23, 2022

Calibration Date: March 23, 2022

Issued Date: March 25, 2022

Calibration By: Mr. Rungroje Metakul



PENTA CALIBRATION CO.,LTD

(Signature)

(Mr.Kriangsak Kalasri)

Reviewed by

Approved By :

(Signature)

(Mr. Keattisak Kerdto)

Laboratory Manager

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

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

This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co., ltd



Represent to Certificate of Calibration ,PTC/07/22102

Certificate No.: PTC/07/22102

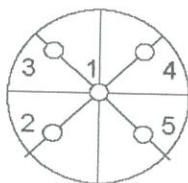
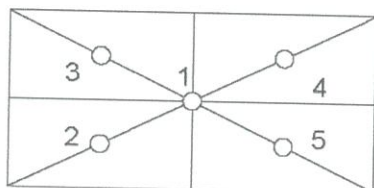
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Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3 ,1/2 or of Maximum capacity



Eccentricity test 50 (g)

Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0001	0.0000	0.0001
Maximum deviation:			0.0001	

Repeatability Test : Weight to be $1/2 \leq L_1 \leq$ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
100	0.00009

Error of indication : from nominal value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.00026	2.87
0.01	0.01000	0.0100	0.0000	0.00026	2.65
0.05	0.05000	0.0500	0.0000	0.00026	2.65
0.1	0.10000	0.1000	0.0000	0.00026	2.65
0.5	0.50000	0.4999	0.0001	0.00026	2.65
1	1.00000	0.9999	0.0001	0.00026	2.65
2	2.00000	1.9999	0.0001	0.00026	2.65
5	5.00001	5.0000	0.0000	0.00026	2.65
10	10.00000	10.0001	-0.0001	0.00026	2.65
20	20.00003	20.0001	-0.0001	0.00026	2.52
100	100.00004	100.0001	-0.0001	0.00027	2.18

Note: Weight of adjust - (g)

The End of Certificate



ROTA METER CALIBRATION RESULT OCTOBER 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0577	01 Oct 22	$Y = 1.0202x + 0.1976$	1.0000
BKK_FS0579	01 Oct 22	$Y = 1.0078x + 0.4789$	0.9998
BKK_FS0583	01 Oct 22	$Y = 1.016x + 0.3922$	1.0000
BKK_FS0584	01 Oct 22	$Y = 1.0036x + 2.2262$	0.9997
BKK_FS0585	01 Oct 22	$Y = 1.0189x - 5.6476$	0.9997
BKK_FS0586	01 Oct 22	$Y = 1.0095x - 1.1524$	0.9995
BKK_FS0587	01 Oct 22	$Y = 1.013x - 3.6619$	0.9996
BKK_FS0588	01 Oct 22	$Y = 1.0154x + 4.8357$	0.9999
BKK_FS0589	01 Oct 22	$Y = 0.9918x + 4.8069$	0.9999
BKK_FS0590	01 Oct 22	$Y = 1.0038x - 0.4857$	0.9996
BKK_FS0591	01 Oct 22	$Y = 0.9705x - 52.174$	0.9986
BKK_FS0592	01 Oct 22	$Y = 0.9646x - 37.642$	0.9985
BKK_FS0593	01 Oct 22	$Y = 0.9767x - 58.445$	0.9988
BKK_FS0594	01 Oct 22	$Y = 0.9902x - 62.87$	0.9999
BKK_FS0595	01 Oct 22	$Y = 1.0249x - 98.162$	0.9999
BKK_FS0596	01 Oct 22	$Y = 0.9843x - 26.806$	0.9991
BKK_FS0597	01 Oct 22	$Y = 0.9802x - 61.653$	0.9978
BKK_FS1004	01 Oct 22	$Y = 0.9762x + 11.724$	0.9998
BKK_FS1005	01 Oct 22	$Y = 1.0081x + 1.5143$	1.0000
BKK_FS1006	01 Oct 22	$Y = 1.098x - 2.9327$	0.9999
BKK_FS1007	01 Oct 22	$Y = 0.9917x + 1.6592$	1.0000
BKK_FS1008	01 Oct 22	$Y = 1.0132x + 0.7207$	1.0000
BKK_FS1009	01 Oct 22	$Y = 1.0132x + 1.1633$	0.9960
BKK_FS1010	01 Oct 22	$Y = 1.0033x + 0.5758$	0.9999
BKK_FS1011	01 Oct 22	$Y = 1.0234x + 0.1759$	0.9996
BKK_FS1012	01 Oct 22	$Y = 1.0106x - 2.0048$	0.9997
BKK_FS1013	01 Oct 22	$Y = 0.9677x - 35.851$	0.9997
BKK_FS1014	01 Oct 22	$Y = 1.0021x + 0.3148$	0.9998
BKK_FS1015	01 Oct 22	$Y = 0.9994x + 1.786$	1.0000
BKK_FS1016	01 Oct 22	$Y = 1.0105x - 80.256$	0.9998
BKK_FS1017	01 Oct 22	$Y = 0.9995x + 0.649$	1.0000
BKK_FS1018	01 Oct 22	$Y = 1.0011x + 1.1786$	1.0000
BKK_FS1019	01 Oct 22	$Y = 1.0023x - 68.424$	0.9996
BKK_FS1020	01 Oct 22	$Y = 1.0547x - 0.666$	0.9998
BKK_FS1021	01 Oct 22	$Y = 1.018x - 3.3286$	0.9998
BKK_FS1022	01 Oct 22	$Y = 0.9932x - 57.035$	0.9986
BKK_FS1023	01 Oct 22	$Y = 1.0094x + 0.0717$	0.9999
BKK_FS1024	01 Oct 22	$Y = 1.0042x + 0.4086$	0.9997
BKK_FS1025	01 Oct 22	$Y = 1.0132x - 88.507$	0.9996



ROTA METER CALIBRATION RESULT OCTOBER 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS1026	01 Oct 22	$Y = 1.0018x + 1.0776$	0.9997
BKK_FS1027	01 Oct 22	$Y = 1.0053x + 0.231$	0.9995
BKK_FS1028	01 Oct 22	$Y = 0.9792x - 60.312$	0.9982
BKK_FS1029	01 Oct 22	$Y = 0.9935x + 0.8234$	1.0000
BKK_FS1030	01 Oct 22	$Y = 1.0039x + 0.515$	0.9999
BKK_FS1031	01 Oct 22	$Y = 1.009x - 79.295$	0.9998
BKK_FS1039	01 Oct 22	$Y = 0.9967x + 4.5048$	0.9999
BKK_FS1040	01 Oct 22	$Y = 0.9936x + 32.694$	0.9998
BKK_FS1041	01 Oct 22	$Y = 1.067x - 1.999$	1.0000
BKK_FS1042	01 Oct 22	$Y = 1.0019x + 2.1571$	1.0000
BKK_FS1043	01 Oct 22	$Y = 1.1569x - 96.479$	0.8412
BKK_FS1044	01 Oct 22	$Y = 1.0318x - 0.9374$	0.9999
BKK_FS1161	01 Oct 22	$Y = 1.0126x + 0.7738$	0.9999
BKK_FS1162	01 Oct 22	$Y = 0.9994x + 2.6357$	0.9995
BKK_FS1163	01 Oct 22	$Y = 0.977x - 55.03$	0.9987
BKK_FS1164	01 Oct 22	$Y = 0.9914x + 0.8427$	0.9997
BKK_FS1165	01 Oct 22	$Y = 0.9893x + 6.5919$	0.9998
BKK_FS1166	01 Oct 22	$Y = 1.0031x - 77.881$	0.9996
BKK_FS1200	01 Oct 22	$Y = 1.0313x - 0.4602$	0.9995
BKK_FS1201	01 Oct 22	$Y = 1.0045x + 0.15$	0.9996
BKK_FS1202	01 Oct 22	$Y = 0.9702x - 44.156$	0.9994
RYG_FS0197	01 Oct 22	$Y = 1.0039x - 0.179$	0.9999
RYG_FS0198	01 Oct 22	$Y = 0.9964x + 21.757$	1.0000
RYG_FS0199	01 Oct 22	$Y = 1.0577x - 1.7486$	1.0000

Review By :

(Mr. Wichan Choonharat)

Enviro Field Services Manager

Approved By :

(Mr. Sarayuth Jittranont)

Assistant General Manager

CERTIFICATE OF CALIBRATION

Certificate No: WS-01102021

Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.

Manufacturer : Data logger: Novalynx.
: Cup anemometer: Novalynx.

Model/Type : Data logger: 200-WS-25DL
: Cup anemometer: WS-02F

Serial Number : Data logger: A4985
: Cup anemometer: -

ID No : Data logger: RYG_FS0085
: Cup anemometer: -

Customer : ALS laboratory group (Thailand) co., ltd.
: 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Test Conditions	: Wind tunnel cross test section area	900	cm ²
	: Anemometer frontal area	100	cm ²
	: Diameter of mounting pipe	-	mm
	: Blockage ratio of test object	0.111	[-]

Test Conditions	: Air temperature	24.0	±0.8 °C
	: Air pressure	1008.1	±0.4 hPa
	: Relative air humidity	58.1	±3.5 %RH

Calibration Procedure : Calibration was carried out base on;
IEC 61400-12-1 ED.1: 2005-Power Performance Measurements of Electricity Producing Wind Turbines;
M&SNET Anemometer Calibration Procedure – Version 2: 2009;

Traceability : This calibration documents the traceable to national standard, Which realize the unit of measurements according to the international system of units (SI) through National Institute of Metrology Thailand (NIMT).

Measurement Date : Oct 08, 2021.

Issued Date : Oct 11, 2021.

Calibrated by

- ☒ Mr. Sorawit Thachalad
☐ Miss Orathai Wiwatwittaya



Approved Signatory:

Mr. Parinya Booncharoen
Mr. Parinya Booncharoen
Technical Support
and Calibration Manager

Continuation of Certificate of Calibration Number

Certificate No: WS-01102021

Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment

Calibration in the range of 1 – 16 m/s at a calibration interval of 1 m/s.

The results of calibration and associated measurement uncertainties are reported in the table below.

V _{STD} Reading m/s	V _{UUC*} Reading m/s	Error (m/s)	Uncertainty (%)
2.049	1.9	-0.1	2.7
4.103	4.0	-0.1	1.3
6.01	6.0	0.0	1.1
8.01	8.0	0.0	0.99
9.99	10.0	0.0	1.0
11.99	12.1	0.1	0.64
13.98	14.1	0.1	0.55
16.02	16.2	0.2	0.40
15.03	15.2	0.2	0.78
12.99	13.1	0.1	0.61
11.00	11.0	0.0	1.1
9.00	9.0	0.0	0.75
7.02	7.0	0.0	0.84
5.147	5.0	-0.1	0.98
2.974	2.9	-0.1	1.7
1.013	0.9	-0.1	4.5

UUC*: Unit Under Calibration

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

Appendix 1: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Pitot static	TESTO INC.	06352145	Aug 07, 2021	MW-0034-21	5 – 30 m/s
2	Precision Differential Pressure Meter	Zoglab	DPM2500	Aug 07, 2021	MW-0034-21	5 – 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8455-12	Aug 08, 2021	MW-0035-21	0 – 5 m/s
4	Temperature	Zoglab	DSR-THP	March 30, 2021	CL-027-64	-30 – 70°C
5	Relative humidity	Zoglab	DSR-THP	March 30, 2021	RH-03032021	0 – 100 %RH
6	Atmospheric pressure	Zoglab	DSR-THP	March 30, 2021	BP-01032021	500 – 1100 hPa
7	Wind tunnel	ESSOM	MP330D	-	-	0 – 50 Hz

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No.: WD-01102021

Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novalynx.
: Wind direction sensor: Novalynx.

Model/Type : Data logger: 200-WS-25DL
: Wind direction sensor: WS-02F

Serial Number : Data logger: A4985
: Wind direction sensor: -

ID No : Data logger: RYG_FS0085
: Wind direction sensor: -

Customer : ALS laboratory group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10260
Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of (23 ± 3) °C, and relative humidity of (40 ± 10) %.

Measurement Method:

The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and line laser is used for axis control, The measurement were taken at 45° intervals in clockwise and counterclockwise directions.

Note: The UUC was warmed up for 1 hour prior to the calibration being performed

Traceability:

The measurement results are traceable to the international system of units (SI) through Certificate No.: CC563-07-0045, Certificate No.: KWS64/0025.

Measurement Date : Oct 08, 2021.

Issued Date : Oct 11, 2021.

Performed by

- ☒ Mr. Sorawit Thachalad
☐ Miss Orathai Wiwatwittaya



Approved Signatory:.....

Mr. Parinya Booncharoen.
Technical Support
and Calibration Manager

Continuation of Certificate of Calibration Number

Certificate No: WD-01102021

Pages 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.

Calibration in the range of 0 – 360 ° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	42	-3	3.0
3		90	90	88	-2	3.0
4		135	135	135	0	3.0
5		180	180	182	2	3.0
6		225	225	228	3	3.0
7		270	270	273	3	3.0
8		315	315	318	3	3.0
9	Counter Clockwise	0/360	360	359	-1	3.0
10		45	45	42	-3	3.0
11		90	90	88	-2	3.0
12		135	135	135	0	3.0
13		180	180	182	2	3.0
14		225	225	228	3	3.0
15		270	270	273	3	3.0
16		315	315	318	3	3.0

UUC*: Unit Under Calibration The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

End of Certificate of Calibration





CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date : 12 Jul 22
Next Cal. Date : 12 Jan 23

Barometric Pressure (mm.Hg) : 755
Relative Humidity (%) : 70.0
Temperature (°C) : 30.0

Console Control Meter Data

Calibration No. : C-120722-RYG_FS0315
Dry Gas Meter No. : RYG_FS0315
Console Serial No. : 1706091
Console Model No. : XC-572-V

Reference Dry Gas Meter Data

Serial No. : A2003240
Model No. : DGM-SK25RM-QS8
Correction Factor (Yr) : 1.0160
Next Calibration Date : 27 May 23

ΔH (mm.H ₂ O)	\ominus Minutes	Reference Dry Gas Meter Calibration				Console Control ; Drygas Meter						Dry Gas Meter	Orifice
		Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg.Tm (°C)	Correction	Calibration
		Final	Initial	Total		Final	Initial	Total				Factor (Y)	Factor $\Delta H@$
15	12.30	150.00	0.00	150.00	27.0	1444203.0	1444058.0	145.00	27.0	27.0	27.0	1.0495	46.1284
25	9.45	150.00	0.00	150.00	30.0	1444395.0	1444249.0	146.00	28.0	28.0	28.0	1.0344	46.1390
50	6.73	150.00	0.00	150.00	31.0	1444742.0	1444596.0	146.00	28.0	28.0	28.0	1.0285	47.1115
100	4.70	150.00	0.00	150.00	31.0	1445051.0	1444905.0	146.00	30.0	30.0	30.0	1.0304	45.6506
150	3.81	150.00	0.00	150.00	33.0	1445209.0	1445064.0	145.00	30.0	30.0	30.0	1.0257	45.5919
											Avg.	1.0337	46.1243

Y : Ratio of reading of reference to dry gas meter : tolerance for individual values ± 0.02 from average .

$\Delta H@$: Orifice pressure differential that equates to 21.24 lm of air @ 25 C and 760 mm of mercury , mmH₂O ; tolerance for individual values ± 5.08 from average .

Procedure; 40 CFR 60,APP A,METH ,SEC 5.3 & 7

Calibrated by:

(Mr.Tinnakorn Kulchart)

Field Scientist(1)

Approved by:

(Mr.Natthapol Jiengwareewong)

Field Specialist(1)



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	12-Jul-22	Ambient Temperature (°C) :	30
Calibration sheet No. :	C-120722-RYG_FS0316	Relative Humidity (%) :	70

Digital Temperature ID	RYG_FS0316	Reference Temperature ID .:	BKK_FS1144
Console Serial No. :	1706091	Serial No. :	201090006013
Console Model :	XC-572-V	Model :	Digicon-CC-VT-MS
		Next Calibrate :	31 Jan 23

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	27	2	
	50	53	3	
	100	104	4	
	150	154	4	
	200	202	2	
	250	253	3	
	300	304	4	
	500	505	5	
	1000	1003	3	
Probe	1200	1202	2	
	100	104	4	
	125	129	4	
Oven	150	154	4	
	100	104	4	
	125	129	4	
Filter	150	154	4	
	100	104	4	
	125	129	4	
Exit	150	154	4	
	0	0	0	
	10	11	1	
Meter	20	22	2	
	0	0	0	
	25	27	2	
AUX	50	52	2	
	0	0	0	
	25	27	2	
	50	53	3	

Calibrated by : _____

(Mr.tinnakorn Kulchart)

Field Scientist (1)

Approved by : _____

(Mr.Natthapol Jiengwareewong)

Field Specialist(1)



PROBE NOZZLE DIAMETER
CALIBRATION DATA SHEET

Calibration Date	12 Jul 22	Nozzle Set ID. :	RYG_FS0319
Calibration Sheet No. :	C-120722-RYG_FS0319	Vernier Caliper ID. :	BKK_FS0626

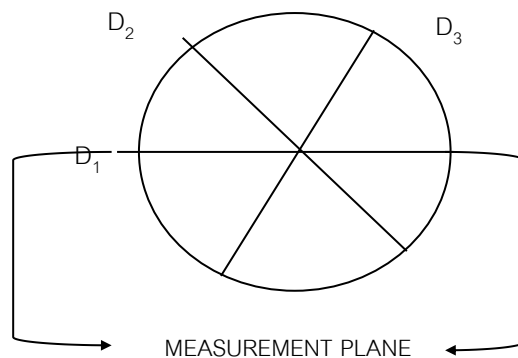
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	$(D_1 + D_2 + D_3) / 3$
	D_1	D_2	D_3	ΔD	D_{avg}
1	0.300	0.300	0.300	0.000	0.300
2	0.470	0.465	0.465	0.005	0.467
3	0.600	0.600	0.600	0.006	0.600
4	0.770	0.760	0.755	0.015	0.762
5	0.920	0.930	0.930	0.010	0.927
6	1.080	1.080	1.085	0.005	1.082
7	1.240	1.220	1.235	0.020	1.232
8	1.550	1.570	1.540	0.030	1.553

Where :

D_1, D_2, D_3 = There different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by : _____

(tinnakorn Kulchar)

Field Scientist (1)

Approved by : _____

(Mr.Natthapol Jiengwareewong)

Field Specialist(1)



Pitot Tube Calibration Data

Pitot Tube Identification Number : RYG_FS0320 Calibration Date : 12 Jul 22
 Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
 Calibration Sheet No. : C-120722-RYG_FS0320 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			\bar{C}_p	0.842	0.842

$$Cp(S) = Cp_{(std)} \sqrt{\frac{\Delta P(std)}{\Delta P(s)}}$$

$$\left| \bar{C}_{p(A)} - \bar{C}_{p(B)} \right| \text{ must BE } \leq 0.01$$

$$\text{Average deviation}(A \text{ or } B) = \frac{\sum_i [Cp(s) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by : _____

(Mr.tinnakorn Kulchar)

Field Scientist (1)

Approved by : _____

(Mr.Natthapol Jiengwareewong)

Field Specialist(1)



Pitot Tube Calibration Data

Pitot Tube Identification Number : RYG_FS0321 Calibration Date : 12 Jul 22
 Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
 Calibration Sheet No. : C-120722-RYG_FS0321 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			\bar{C}_p	0.842	0.842

$$Cp(S) = Cp_{(std)} \sqrt{\frac{\Delta P(std)}{\Delta P(s)}}$$

$$\left| \bar{C}_{p(A)} - \bar{C}_{p(B)} \right| \text{ must BE } \leq 0.01$$

$$\text{Average deviation}(A \text{ or } B) = \frac{\sum_i [Cp(s) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by : _____

(Mr.tinnakorn Kulchar)

Field Scientist (1)

Approved by : _____

(Mr.Natthapol Jiengwareewong)

Field Specialist(1)



DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date : 12 Jul 22

Next Calibration Date : 12 Jan 23

Barometric Pressure (mm.Hg) : 755

Relative Humidity (%) : 70.0

Temperature (°C) : 30.0

Dry Gas Meter Data

Calibration sheet No.: C-120722-RYG_FS0317

Dry Gas Meter No.: RYG_FS0317

Console Serial No.: 1706003

Model No.: XC-62-CV

Reference Dry Gas Meter Data

Serial No. : A2003240

Model No. : DGM-SK25RM-QS8

Correction Factor (Yr) : 1.0160

Next Calibration Date : 27 May 23

Reference Dry Gas Meter Calibration				Dry Gas Meter						Dry Gas Meter
Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg. Tm (°C)	Correction
Final	Initial	Total		Final	Initial	Total				Factor (Y)
30.00	0.00	30.00	28.0	29.99	0.00	29.99	28.0	27.0	27.5	1.0147
30.00	0.00	30.00	28.0	30.01	0.00	30.01	28.0	28.0	28.0	1.0157
60.00	0.00	60.00	28.0	60.20	0.00	60.20	29.0	29.0	29.0	1.0160
60.00	0.00	60.00	28.0	60.12	0.00	60.12	29.0	29.0	29.0	1.0173
90.00	0.00	90.00	28.0	89.97	0.00	89.97	30.0	30.0	30.0	1.0231
90.00	0.00	90.00	28.0	90.10	0.00	90.10	30.0	30.0	30.0	1.0216
									Avg.	1.0181

Y = Ratio of reading of reference dry gas meter to dry gas meter ; tolerance for individual ± 0.02 from average.

Calibrate by :

Mr.Tinnakorn Kulchart
Field Scientist (1)

Approved by :

(Mr.Natthapol Jiengwareewong)
Field Specialist(1)



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 12 Jul 22	Ambient Temperature (°C) : 30
Calibration sheet No. : C-120722-RYG_FS0317	Relative Humidity (%) : 70
Digital Temperature ID : RYG_FS0317	Reference Temperature ID. : BKK_FS1144
Serial No. : 1706003	Serial No. : 201090006013
Model : XC-62-CV	Model : Digicon-CC-VT-MS
	Next Calibrate : 31 Jan 23

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	25	0	
	50	50	0	
	100	100	0	
	150	151	1	
	200	201	1	
	250	251	1	
	300	301	1	
	500	501	1	
	1000	1002	2	
	1200	1203	3	
Probe	100	100	0	
	125	125	0	
	150	151	1	
Filter	100	100	0	
	125	125	0	
	150	151	1	
Exit	0	0	0	
	10	10	0	
	20	20	0	
Meter	0	0	0	
	25	25	0	
AUX	50	50	0	
	0	0	0	
	25	25	0	
	50	50	0	

Calibrated by : 

(Mr.tinnakorn Kulchart)

Field Scientist (1)

Approved by : 

(Mr.Natthapol Jiengwareewong)

Field Specialist(1)



Rotameter Calibration Report

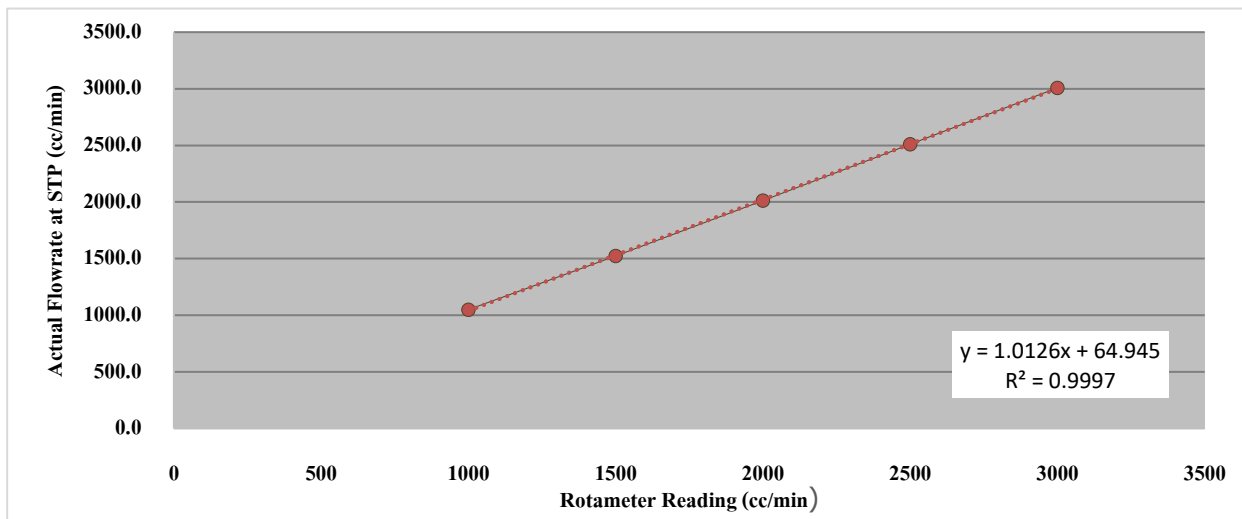
Calibration Date	: 12 Jul 22	Relative Humidity (%)	: 70.0
Rotameter ID	: RYG_FS0317	Barometric Pressure (mmHg)	: 755
Calibration Sheet No	: C-120722-RYG_FS0317	Temperature (°C)	: 30.0

Primary Equipment Data

Brand	: Bios	Model	: Defender 520 M
Serial No.	: 129958	ID	: RYG_FS0209

Calibration Data

Rotameter Reading(cc/min)	Actual Flowrate (cc/min)				Actual Flowrate at STP (cc/min)
	1	2	3	Avg.	
1000	1085.0	1073.0	1065.0	1074.3	1049.6
1500	1548.0	1566.0	1565.0	1559.7	1523.8
2000	2065.0	2054.0	2058.0	2059.0	2011.7
2500	2573.0	2569.0	2567.0	2569.7	2510.6
3000	3064.0	3089.0	3085.0	3079.3	3008.6



Calibrated by :

(Mr.tinnakorn Kulchat)

Field Scientist (1)

Approved By :

(Mr.Natthapol Jiengwareewong)

Field Specialist(1)



REVIEW BY	Autcharawan S.
APPROVED BY	Sarasat M.
NEXT CAL. DATE	12 / Jan / 23
	12 / Jan / 22

Certificate of Calibration

ICS-2100: Anion (ID#659)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co., Ltd.

ICS-2100 S/N: 15010977

AS-HV S/N: 5450A36659

For

ALS Laboratory Group (Thailand) Co., Ltd.



Operator Signature: _____

Date: Jan 12, 2022

(Mr.Thitipong Piromkripuk)

Applications Chemist



PENTA
CALIBRATION

PENTA CALIBRATION CO., LTD.

66/124 The Connect 33 Village Kanchanaphisek Road
Dokmai Prawet Bangkok 10250
Tel: +66 (0) 2069-9773
www.pentacal.com

Certificate of Calibration

Represent to Certificate of Calibration ,PTC/07/22099

Certificate No.:	PTC/07/22099	Page:	1 of 2
Equipment:	Digital Balance	Condition:	Normal
Manufacturer:	Sartorius	Serial No:	31709552
Model:	MSU224S-100-DU	ID No:	RYG_EN0003
Type of Balance:	Single interval		



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

REVIEW BY Thanitall.
APPROVED BY D. [Signature]
NEXT CAL. DATE 23/03/23

Environment Condition: Temperature 23.9 °C ± 0.3 °C
Humidity 58.1 %RH ± 4.4 %RH
Air density 1.17 kg/m³

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

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd.
, NSC-ONSC Accreditation No.: Calibration 0189

Date Received: March 23, 2022

Calibration Date: March 23, 2022

Issued Date: March 25, 2022

Calibration By: Mr. Rungroje Metakul



PENTA CALIBRATION CO.,LTD

[Signature]
(Mr.Kriangsak Kalasri)

Reviewed by

Approved By : [Signature]
(Mr. Keattisak Kerdto)

Laboratory Manager

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

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

This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co., ltd



Represent to Certificate of Calibration ,PTC/07/22099

Certificate No.: PTC/07/22099

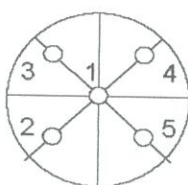
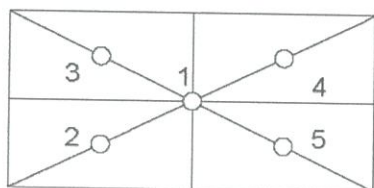
Page: 2 of 2

Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3 ,1/2 or of Maximum capacity



Eccentricity test 100 (g)

Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0001	-0.0001	0.0001
Maximum deviation:				0.0001

Repeatability Test : Weight to be $1/2 \leq L_1 \leq$ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
200	0.00007

Error of indication : from nominal value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.00020	2.65
0.01	0.01000	0.0099	0.0001	0.00020	2.43
0.1	0.10000	0.1000	0.0000	0.00020	2.43
0.5	0.50000	0.5000	0.0000	0.00020	2.43
1	1.00000	1.0000	0.0000	0.00020	2.43
5	5.00001	5.0000	0.0000	0.00020	2.43
10	10.00000	10.0000	0.0000	0.00020	2.43
20	20.00003	20.0000	0.0000	0.00020	2.43
50	50.00004	50.0000	0.0000	0.00021	2.32
100	100.00004	99.9999	0.0001	0.00022	2.17
200	200.00011	200.0000	0.0001	0.00027	2.05

Note: Weight of adjust - (g)

The End of Certificate

CEMs Data

Client Name S and L Specialty Polymers Co.,Ltd.

Location _____ Cl2 Eliminator _____

Plant Name _____

Run No: 1

Run No: 2

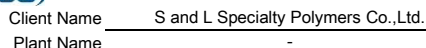
Run No: 3

Run No: 4

Run No: 5

Run No: 6

Date	Time	Chlorine mg/m3	Date	Time	Chlorine mg/m3	Date	Time	Chlorine mg/m3	Date	Time	Chlorine mg/m3	Date	Time	Chlorine mg/m3	Date	Time	Chlorine mg/m3
17-Oct-22	11:00	0.00	17-Oct-22	12:00	0.00	17-Oct-22	13:00	0.00	17-Oct-22	14:00	0.00	17-Oct-22	15:00	0.00	18-Oct-22	9:10	0.00
17-Oct-22	11:01	0.00	17-Oct-22	12:01	0.00	17-Oct-22	13:01	0.00	17-Oct-22	14:01	0.00	17-Oct-22	15:01	0.00	18-Oct-22	9:11	0.00
17-Oct-22	11:02	0.00	17-Oct-22	12:02	0.00	17-Oct-22	13:02	0.00	17-Oct-22	14:02	0.00	17-Oct-22	15:02	0.00	18-Oct-22	9:12	0.00
17-Oct-22	11:03	0.00	17-Oct-22	12:03	0.00	17-Oct-22	13:03	0.00	17-Oct-22	14:03	0.00	17-Oct-22	15:03	0.00	18-Oct-22	9:13	0.00
17-Oct-22	11:04	0.00	17-Oct-22	12:04	0.00	17-Oct-22	13:04	0.00	17-Oct-22	14:04	0.00	17-Oct-22	15:04	0.00	18-Oct-22	9:14	0.00
17-Oct-22	11:05	0.00	17-Oct-22	12:05	0.00	17-Oct-22	13:05	0.00	17-Oct-22	14:05	0.00	17-Oct-22	15:05	0.00	18-Oct-22	9:15	0.00
17-Oct-22	11:06	0.00	17-Oct-22	12:06	0.00	17-Oct-22	13:06	0.00	17-Oct-22	14:06	0.00	17-Oct-22	15:06	0.00	18-Oct-22	9:16	0.00
17-Oct-22	11:07	0.00	17-Oct-22	12:07	0.00	17-Oct-22	13:07	0.00	17-Oct-22	14:07	0.00	17-Oct-22	15:07	0.00	18-Oct-22	9:17	0.00
17-Oct-22	11:08	0.00	17-Oct-22	12:08	0.00	17-Oct-22	13:08	0.00	17-Oct-22	14:08	0.00	17-Oct-22	15:08	0.00	18-Oct-22	9:18	0.00
17-Oct-22	11:09	0.00	17-Oct-22	12:09	0.00	17-Oct-22	13:09	0.00	17-Oct-22	14:09	0.00	17-Oct-22	15:09	0.00	18-Oct-22	9:19	0.00
17-Oct-22	11:10	0.00	17-Oct-22	12:10	0.00	17-Oct-22	13:10	0.00	17-Oct-22	14:10	0.00	17-Oct-22	15:10	0.00	18-Oct-22	9:20	0.00
17-Oct-22	11:11	0.00	17-Oct-22	12:11	0.00	17-Oct-22	13:11	0.00	17-Oct-22	14:11	0.00	17-Oct-22	15:11	0.00	18-Oct-22	9:21	0.00
17-Oct-22	11:12	0.00	17-Oct-22	12:12	0.00	17-Oct-22	13:12	0.00	17-Oct-22	14:12	0.00	17-Oct-22	15:12	0.00	18-Oct-22	9:22	0.00
17-Oct-22	11:13	0.00	17-Oct-22	12:13	0.00	17-Oct-22	13:13	0.00	17-Oct-22	14:13	0.00	17-Oct-22	15:13	0.00	18-Oct-22	9:23	0.00
17-Oct-22	11:14	0.00	17-Oct-22	12:14	0.00	17-Oct-22	13:14	0.00	17-Oct-22	14:14	0.00	17-Oct-22	15:14	0.00	18-Oct-22	9:24	0.00
17-Oct-22	11:15	0.00	17-Oct-22	12:15	0.00	17-Oct-22	13:15	0.00	17-Oct-22	14:15	0.00	17-Oct-22	15:15	0.00	18-Oct-22	9:25	0.00
17-Oct-22	11:16	0.00	17-Oct-22	12:16	0.00	17-Oct-22	13:16	0.00	17-Oct-22	14:16	0.00	17-Oct-22	15:16	0.00	18-Oct-22	9:26	0.00
17-Oct-22	11:17	0.00	17-Oct-22	12:17	0.00	17-Oct-22	13:17	0.00	17-Oct-22	14:17	0.00	17-Oct-22	15:17	0.00	18-Oct-22	9:27	0.00
17-Oct-22	11:18	0.00	17-Oct-22	12:18	0.00	17-Oct-22	13:18	0.00	17-Oct-22	14:18	0.00	17-Oct-22	15:18	0.00	18-Oct-22	9:28	0.00
17-Oct-22	11:19	0.00	17-Oct-22	12:19	0.00	17-Oct-22	13:19	0.00	17-Oct-22	14:19	0.00	17-Oct-22	15:19	0.00	18-Oct-22	9:29	0.00
17-Oct-22	11:20	0.00	17-Oct-22	12:20	0.00	17-Oct-22	13:20	0.00	17-Oct-22	14:20	0.00	17-Oct-22	15:20	0.00	18-Oct-22	9:30	0.00
17-Oct-22	11:21	0.00	17-Oct-22	12:21	0.00	17-Oct-22	13:21	0.00	17-Oct-22	14:21	0.00	17-Oct-22	15:21	0.00	18-Oct-22	9:31	0.00
17-Oct-22	11:22	0.00	17-Oct-22	12:22	0.00	17-Oct-22	13:22	0.00	17-Oct-22	14:22	0.00	17-Oct-22	15:22	0.00	18-Oct-22	9:32	0.00
17-Oct-22	11:23	0.00	17-Oct-22	12:23	0.00	17-Oct-22	13:23	0.00	17-Oct-22	14:23	0.00	17-Oct-22	15:23	0.00	18-Oct-22	9:33	0.00
17-Oct-22	11:24	0.00	17-Oct-22	12:24	0.00	17-Oct-22	13:24	0.00	17-Oct-22	14:24	0.00	17-Oct-22	15:24	0.00	18-Oct-22	9:34	0.00
17-Oct-22	11:25	0.00	17-Oct-22	12:25	0.00	17-Oct-22	13:25	0.00	17-Oct-22	14:25	0.00	17-Oct-22	15:25	0.00	18-Oct-22	9:35	0.00
17-Oct-22	11:26	0.00	17-Oct-22	12:26	0.00	17-Oct-22	13:26	0.00	17-Oct-22	14:26	0.00	17-Oct-22	15:26	0.00	18-Oct-22	9:36	0.00
17-Oct-22	11:27	0.00	17-Oct-22	12:27	0.00	17-Oct-22	13:27	0.00	17-Oct-22	14:27	0.00	17-Oct-22	15:27	0.00	18-Oct-22	9:37	0.00
17-Oct-22	11:28	0.00	17-Oct-22	12:28	0.00	17-Oct-22	13:28	0.00	17-Oct-22	14:28	0.00	17-Oct-22	15:28	0.00	18-Oct-22	9:38	0.00
17-Oct-22	11:29	0.00	17-Oct-22	12:29	0.00	17-Oct-22	13:29	0.00	17-Oct-22	14:29	0.00	17-Oct-22	15:29	0.00	18-Oct-22	9:39	0.00
17-Oct-22	11:30	0.00	17-Oct-22	12:30	0.00	17-Oct-22	13:30	0.00	17-Oct-22	14:30	0.00	17-Oct-22	15:30	0.00	18-Oct-22	9:40	0.00
17-Oct-22	11:31	0.00	17-Oct-22	12:31	0.00	17-Oct-22	13:31	0.00	17-Oct-22	14:31	0.00	17-Oct-22	15:31	0.00	18-Oct-22	9:41	0.00
17-Oct-22	11:32	0.00	17-Oct-22	12:32	0.00	17-Oct-22	13:32	0.00	17-Oct-22	14:32	0.00	17-Oct-22	15:32	0.00	18-Oct-22	9:42	0.00
17-Oct-22	11:33	0.00	17-Oct-22	12:33	0.00	17-Oct-22	13:33	0.00	17-Oct-22	14:33	0.00	17-Oct-22	15:33	0.00	18-Oct-22	9:43	0.00
17-Oct-22	11:34	0.00	17-Oct-22	12:34	0.00	17-Oct-22	13:34	0.00	17-Oct-22	14:34	0.00	17-Oct-22	15:34	0.00	18-Oct-22	9:44	0.00
17-Oct-22	11:35	0.00	17-Oct-22	12:35	0.00	17-Oct-22	13:35	0.00	17-Oct-22	14:35	0.00	17-Oct-22	15:35	0.00	18-Oct-22	9:45	0.00
17-Oct-22	11:36	0.00	17-Oct-22	12:36	0.00	17-Oct-22	13:36	0.00	17-Oct-22	14:36	0.00	17-Oct-22	15:36	0.00	18-Oct-22	9:46	0.00
17-Oct-22	11:37	0.00	17-Oct-22	12:37	0.00	17-Oct-22	13:37	0.00	17-Oct-22	14:37	0.00	17-Oct-22	15:37	0.00	18-Oct-22	9:47	0.00
17-Oct-22	11:38	0.00	17-Oct-22	12:38	0.00	17-Oct-22	13:38	0.00	17-Oct-22	14:38	0.00	17-Oct-22	15:38	0.00	18-Oct-22	9:48	0.00
17-Oct-22	11:39	0.00	17-Oct-22	12:39	0.00	17-Oct-22	13:39	0.00	17-Oct-22	14:39	0.00	17-Oct-22	15:39	0.00	18-Oct-22	9:49	0.00
17-Oct-22	11:40	0.00	17-Oct-22	12:40	0.00	17-Oct-22	13:40	0.00	17-Oct-22	14:40	0.00	17-Oct-22	15:40	0.00	18-Oct-22	9:50	0.00
17-Oct-22	11:41	0.00	17-Oct-22	12:41	0.00	17-Oct-22	13:41	0.00	17-Oct-22	14:41	0.00	17-Oct-22	15:41	0.00	18-Oct-22	9:51	0.00
17-Oct-22	11:42	0.00	17-Oct-22	12:42	0.00	17-Oct-22	13:42	0.00	17-Oct-22	14:42	0.00	17-Oct-22	15:42	0.00	18-Oct-22	9:52	0.00
17-Oct-22	11:43	0.00	17-Oct-22	12:43	0.00	17-Oct-22	13:43	0.00	17-Oct-22	14:43	0.00	17-Oct-22	15:43	0.00	18-Oct-22	9:53	0.00
17-Oct-22	11:44	0.00	17-Oct-22	12:44	0.00	17-Oct-22	13:44	0.00	17-Oct-22	14:44	0.00	17-Oct-22	15:44	0.00	18-Oct-22	9:54	0.00
17-Oct-22	11:45	0.00	17-Oct-22	12:45	0.00	17-Oct-22	13:45	0.00	17-Oct-22	14:45	0.00	17-Oct-22	15:45	0.00	18-Oct-22	9:55	0.00
17-Oct-22	11:46	0.00	17-Oct-22	12:46	0.00	17-Oct-22	13:46	0.00	17-Oct-22	14:46	0.00	17-Oct-22	15:46	0.00	18-Oct-22	9:56	0.00
17-Oct-22	11:47	0.00	17-Oct-22	12:47	0.00	17-Oct-22	13:47	0.00	17-Oct-22	14:47	0.00	17-Oct-22	15:47	0.00	18-Oct-22	9:57	0.00
17-Oct-22	11:48	0.00	17-Oct-22	12:48	0.00	17-Oct-22	13:48	0.00	17-Oct-22	14:48	0.00	17-Oct-22	15:48	0.00	18-Oct-22	9:58	0.00
17-Oct-22	11:49	0.00	17-Oct-22	12:49	0.00	17-Oct-22	13:49	0.00	17-Oct-22	14:49	0.00	17-Oct-22	15:49	0.00	18-Oct-22	9:59	0.00
17-Oct-22	11:50	0.00	17-Oct-22	12:50	0.00	17-Oct-22	13:50	0.00	17-Oct-22	14:50	0.00	17-Oct-22	15:50	0.00	18-Oct-22	10:00	0.00
17-Oct-22	11:51	0.00	17-Oct-22	12:51	0.00	17-Oct-22	13:51	0.00	17-Oct-22	14:51	0.00	17-Oct-22	15:51	0.00	18-Oct-22	10:01	0.00
17-Oct-22	11:52	0.00	17-Oct-22	12:52	0.00	17-Oct-22	13:52	0.00	17-Oct-22	14:52	0.00	17-Oct-22	15:52	0.00	18-Oct-22	10:02	0.00
17-Oct-22	11:53	0.00	17-Oct-22	12:53	0.00	17-Oct-22	13:53	0.00	17-Oct-22	14:53	0.00	17-Oct-22	15:53	0.00	18-Oct-22	10:03	0.00
17-Oct-22	11:54	0.00	17-Oct-22	12:54	0.00	17-Oct-22	13:54	0.00	17-Oct-22	14:54	0.00	17-Oct-22	15:54	0.00	18-Oct-22	10:04	0.00
17-Oct-22	11:55	0.00	17-Oct-22	12:55	0.00	17-Oct-22	13:55	0.00	17-Oct-22	14:55	0.00	17-Oct-22	15:55	0.00	18-Oct-22	10:05	0.00
17-Oct-22	11:56	0.00	17-Oct-22	12:56	0.00	17-Oct-22	13:56	0.00	17-Oct-22	14:56	0.00	17-Oct-22	15:56	0.00	18-Oct-22	10:06	0.00
17-Oct-22	11:57	0.00	17-Oct-22	12:57	0.00	17-Oct-22	13:57	0.00	17-Oct-22	14:57	0.00	17-Oct-22	15:57	0.00	18-Oct-22	10:07	0.00
17-Oct-22	11:58	0.00	17-Oct-22	12:58	0.00	17-Oct-22	13:58	0.00	17-Oct-22	14:58	0.00	17-Oct-22	15:58	0.00	18-Oct-22	10:08	0.00
17-Oct-22	11:59	0.00	17-Oct-22	12:59	0.00	17-Oct-22	13:59	0.00	17-Oct-22	14:59	0.00	17-Oct-22	15:59	0.00	18-Oct-22	10:09	0.00
Max Avg		0.00	Max Avg		0.00	Max Avg		0.00	Max Avg		0.00	Max Avg		0.00	Max Avg		0.00



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Run No: 12

[illegible]



ROTA METER CALIBRATION RESULT JULY 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0577	01 Jul 22	$Y = 1.0202x + 0.1976$	1.0000
BKK_FS0579	01 Jul 22	$Y = 1.0078x + 0.4789$	0.9998
BKK_FS0583	01 Jul 22	$Y = 1.016x + 0.3922$	1.0000
BKK_FS0584	01 Jul 22	$Y = 1.0036x + 2.2262$	0.9997
BKK_FS0585	01 Jul 22	$Y = 1.0189x - 5.6476$	0.9997
BKK_FS0586	01 Jul 22	$Y = 1.0095x - 1.1524$	0.9995
BKK_FS0587	01 Jul 22	$Y = 1.013x - 3.6619$	0.9996
BKK_FS0588	01 Jul 22	$Y = 1.0154x + 4.8357$	0.9999
BKK_FS0589	01 Jul 22	$Y = 0.9918x + 4.8069$	0.9999
BKK_FS0590	01 Jul 22	$Y = 1.0038x - 0.4857$	0.9996
BKK_FS0591	01 Jul 22	$Y = 0.9705x - 52.174$	0.9986
BKK_FS0592	01 Jul 22	$Y = 0.9646x - 37.642$	0.9985
BKK_FS0593	01 Jul 22	$Y = 0.9767x - 58.445$	0.9988
BKK_FS0594	01 Jul 22	$Y = 0.9902x - 62.87$	0.9999
BKK_FS0595	01 Jul 22	$Y = 1.0249x - 98.162$	0.9999
BKK_FS0596	01 Jul 22	$Y = 0.9843x - 26.806$	0.9991
BKK_FS0597	01 Jul 22	$Y = 0.9802x - 61.653$	0.9978
BKK_FS1004	01 Jul 22	$Y = 0.9696x + 17.69$	0.9990
BKK_FS1005	01 Jul 22	$Y = 1.0092x + 2.4571$	0.9999
BKK_FS1006	01 Jul 22	$Y = 1.168x - 5.566$	0.9997
BKK_FS1007	01 Jul 22	$Y = 0.9917x + 1.6592$	1.0000
BKK_FS1008	01 Jul 22	$Y = 1.0132x + 0.7207$	1.0000
BKK_FS1009	01 Jul 22	$Y = 1.0132x + 1.1633$	0.9960
BKK_FS1010	01 Jul 22	$Y = 1.0033x + 0.5758$	0.9999
BKK_FS1011	01 Jul 22	$Y = 1.0234x + 0.1759$	0.9996
BKK_FS1012	01 Jul 22	$Y = 1.0106x - 2.0048$	0.9997
BKK_FS1013	01 Jul 22	$Y = 0.9677x - 35.851$	0.9997
BKK_FS1014	01 Jul 22	$Y = 1.0021x + 0.3148$	0.9998
BKK_FS1015	01 Jul 22	$Y = 0.9994x + 1.786$	1.0000
BKK_FS1016	01 Jul 22	$Y = 1.0105x - 80.256$	0.9998
BKK_FS1017	01 Jul 22	$Y = 0.9995x + 0.649$	1.0000
BKK_FS1018	01 Jul 22	$Y = 1.0011x + 1.1786$	1.0000
BKK_FS1019	01 Jul 22	$Y = 1.0023x - 68.424$	0.9996
BKK_FS1020	01 Jul 22	$Y = 1.0547x - 0.666$	0.9998
BKK_FS1021	01 Jul 22	$Y = 1.018x - 3.3286$	0.9998
BKK_FS1022	01 Jul 22	$Y = 0.9932x - 57.035$	0.9986
BKK_FS1023	01 Jul 22	$Y = 1.0094x + 0.0717$	0.9999
BKK_FS1024	01 Jul 22	$Y = 1.0042x + 0.4086$	0.9997
BKK_FS1025	01 Jul 22	$Y = 1.0132x - 88.507$	0.9996



ROTA METER CALIBRATION RESULT JULY 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS1026	01 Jul 22	$Y = 1.0018x + 1.0776$	0.9997
BKK_FS1027	01 Jul 22	$Y = 1.0053x + 0.231$	0.9995
BKK_FS1028	01 Jul 22	$Y = 0.9792x - 60.312$	0.9982
BKK_FS1029	01 Jul 22	$Y = 0.9935x + 0.8234$	1.0000
BKK_FS1030	01 Jul 22	$Y = 1.0039x + 0.515$	0.9999
BKK_FS1031	01 Jul 22	$Y = 1.009x - 79.295$	0.9998
BKK_FS1039	01 Jul 22	$Y = 0.9879x + 7.3524$	0.9996
BKK_FS1040	01 Jul 22	$Y = 0.9704x + 88.336$	0.9987
BKK_FS1041	01 Jul 22	$Y = 1.0645x - 1.7878$	0.9999
BKK_FS1042	01 Jul 22	$Y = 0.9983x + 3.6262$	0.9998
BKK_FS1043	01 Jul 22	$Y = 1.0069x - 6.9619$	1.0000
BKK_FS1044	01 Jul 22	$Y = 1.0355x - 0.6214$	0.9997
BKK_FS1161	01 Jul 22	$Y = 1.0126x + 0.7738$	0.9999
BKK_FS1162	01 Jul 22	$Y = 0.9994x + 2.6357$	0.9995
BKK_FS1163	01 Jul 22	$Y = 0.977x - 55.03$	0.9987
BKK_FS1164	01 Jul 22	$Y = 0.9914x + 0.8427$	0.9997
BKK_FS1165	01 Jul 22	$Y = 0.9893x + 6.5919$	0.9998
BKK_FS1166	01 Jul 22	$Y = 1.0031x - 77.881$	0.9996
BKK_FS1200	01 Jul 22	$Y = 1.0313x - 0.4602$	0.9995
BKK_FS1201	01 Jul 22	$Y = 1.0045x + 0.15$	0.9996
BKK_FS1202	01 Jul 22	$Y = 0.9702x - 44.156$	0.9994
RYG_FS0197	01 Jul 22	$Y = 1.0039x - 0.179$	0.9999
RYG_FS0198	01 Jul 22	$Y = 0.9971x + 16.648$	0.9999
RYG_FS0199	01 Jul 22	$Y = 1.0832x - 2.6367$	1.0000

Review By :

(Mr. Wichan Choonharat)

Enviro Field Services Manager

Approved By :

(Mr. Sarayuth Jittranont)

Assistant General Manager



Certificate of Calibration



Represent to Certificate of Calibration ,PTC/07/22104

Certificate No.:	PTC/07/22104	Page:	1 of 3
Equipment:	Digital Balance	Condition:	Normal
Manufacturer:	Sartorius	Serial No:	33108993
Model:	MSE125P-100-DU	ID No:	RYG_EN0004
Type of Balance:	Single interval		

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

REVIEW BY Thanitall.
 APPROVED BY D. [Signature]
 NEXT CAL. DATE 23/03/23.

Environment Condition: Temperature 23.9 °C ± 0.3 °C
 Humidity 58.1 %RH ± 4.4 %RH
 Air density 1.17 kg/m³

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

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

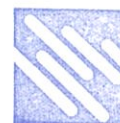
Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd.
 , NSC-ONSC Accreditation No.: Calibration 0189

Date Received: March 23, 2022

Calibration Date: March 23, 2022

Issued Date: March 25, 2022

Calibration By: Mr. Rungroje Metakul



PENTA CALIBRATION CO.,LTD

[Signature]

(Mr.Kriangsak Kalasri)

Reviewed by

Approved By :

[Signature]

(Mr. Keattisak Kerdto)

Laboratory Manager

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

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

This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co ., ltd



Represent to Certificate of Calibration ,PTC/07/22104

Certificate No.: PTC/07/22104

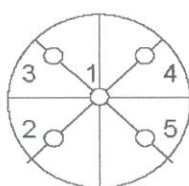
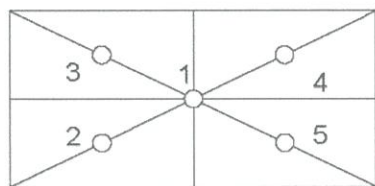
Page: 2 of 3

Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3 ,1/2 or of Maximum capacity



Eccentricity test 50 (g)

Position (g)				
1	2	3	4	5
0.00000	-0.00004	-0.00001	0.00000	0.00001
Maximum deviation:			0.00004	

Repeatability Test : Weight to be $1/2 \leq L_1 \leq$ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
50	0.000007

Error of indication : from nominal value., Readability 0.00001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.000000	0.00000	0.00000	0.000020	2.65
0.01	0.010001	0.01000	0.00000	0.000022	2.17
0.05	0.050002	0.04999	0.00001	0.000022	2.17
0.1	0.099999	0.09999	0.00001	0.000022	2.17
0.5	0.500001	0.50001	-0.00001	0.000022	2.17
1	1.000004	0.99999	0.00001	0.000022	2.14
2	1.999999	1.99999	0.00001	0.000022	2.14
5	5.000015	4.99999	0.00002	0.000023	2.14
10	10.000004	10.00000	0.00000	0.000024	2.10
20	20.000029	20.00000	0.00003	0.000032	2.00
50	50.000043	49.99999	0.00005	0.000069	2.00

Note: Weight of adjust - (g)



Represent to Certificate of Calibration ,PTC/07/22104

Certificate No.: PTC/07/22104

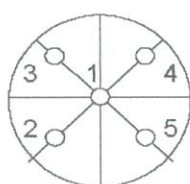
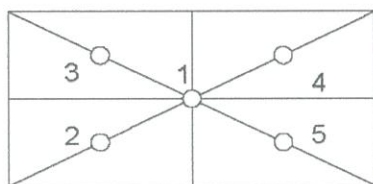
Page: 3 of 3

Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3 ,1/2 or of Maximum capacity



Eccentricity test 50 (g)

Position (g)				
1	2	3	4	5
0.0000	0.0000	0.0000	0.0000	0.0000
Maximum deviation:				0.0000

Repeatability Test : Weight to be $1/2 \leq L_1 \leq$ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
100	0.00000

Error of indication : from nominal value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
65	65.00006	65.0000	0.0001	0.00013	2.00
70	70.00007	70.0000	0.0001	0.00013	2.00
75	75.00009	75.0000	0.0001	0.00014	2.00
80	80.00008	80.0000	0.0001	0.00014	2.00
85	85.00009	85.0000	0.0001	0.00015	2.00
90	90.00010	90.0000	0.0001	0.00015	2.00
95	95.00012	95.0000	0.0001	0.00016	2.00
100	100.00004	100.0000	0.0000	0.00014	2.00
110	110.00004	110.0000	0.0000	0.00015	2.00
120	120.00007	120.0000	0.0001	0.00016	2.00

Note: Weight of adjust - (g)

The End of Certificate

SITHIPHORN ASSOCIATES CO.,LTD.

CALIBRATION LABORATORY



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

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : ACC22013

Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No.: 34178121
ID No.: RYG_FS0213

Condition As Found : GOOD

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

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

Received Date : 22 APRIL 2022
Calibration Date : 26 APRIL 2022
Date of Issue : 29 APRIL 2022

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	26/4/23

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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

Continuation of Calibration Certificate

Cert. No. : ACC22013

Job No. : VC65AC0054

Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	33461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-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).

Continuation of Calibration Certificate

Cert. No. : ACC22013

Job No. : VC65AC0054

Pages : 3 of 3

Result of calibration :**1. Sound pressure level**

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.11	0.11	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1003.1	0.3	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
2.02	0.10	3.0

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 —————

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



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

Cert. No. : ACL21116

Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-21/ Microphone UC-52 / Preamplifier NH-21
Serial No.: 00376364 / 71486 / 23142
ID No.: RYG_FS0012

Condition As Found : GOOD

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

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

Received Date : 21 SEPTEMBER 2021
Calibration Date : 04-06 OCTOBER 2021
Date of Issue : 11 OCTOBER 2021

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	4/10/22

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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

Continuation of Calibration Certificate

Cert. No. : ACL21116

Job No. : VC64AC0070

Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	8846A	1997025	EEL.BP. 06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

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

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

3.1 National Institute of Metrology (Thailand).

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

Continuation of Calibration Certificate

Cert. No. : ACL21116

Job No. : VC64AC0070

Pages : 3 of 9

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	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

Continuation of Calibration Certificate

Cert. No. : ACL21116

Job No. : VC64AC0070

Pages : 4 of 9

Result of calibration :**1. Absolute sensitivity**

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
23.8

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	22.7
Flat	25.6

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	0.1	0.2	0.2	±5.0

Continuation of Calibration Certificate

Cert. No. : ACL21116

Job No. : VC64AC0070

Pages : 5 of 9

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.2	0.0	0.0	±2.0
125	-0.2	0.0	0.0	±1.5
250	-0.1	0.0	-0.1	±1.5
500	-0.1	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.1	±2.0
4000	0.0	0.1	0.1	±3.0
8000	0.0	0.2	0.2	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Continuation of Calibration Certificate

Cert. No. : ACL21116

Job No. : VC64AC0070

Pages : 6 of 9

7. Level linearity on the reference level range

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

Continuation of Calibration Certificate

Cert. No. : ACL21116

Job No. : VC64AC0070

Pages : 7 of 9

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.5
120	94.0	94.0	0.0	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	43.0	43.0	0.0	±0.5
120	33.0	32.6	-0.4	±0.5

9. Tone burst response

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

Continuation of Calibration Certificate

Cert. No. : ACL21116

Job No. : VC64AC0070

Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.00	0.0	-
One	136.4	136	-0.4	±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

11. Overload indication

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

Continuation of Calibration Certificate

Cert. No. : ACL21116

Job No. : VC64AC0070

Pages : 9 of 9

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

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL22114

Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-21/ Microphone UC-52 / Preamplifier NH-21
Serial No.: 00509355 / 143845 / 32731
ID No.: RYG_FS0015

Condition As Found : GOOD

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

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

Received Date : 17 MAY 2022
Calibration Date : 24-27 MAY 2022
Date of Issue : 30 MAY 2022

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	24/5/23

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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Continuation of Calibration Certificate

Cert. No. : ACL22114

Job No. : VC65AC0060

Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	8846A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	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).

Continuation of Calibration Certificate

Cert. No. : ACL22114
Job No. : VC65AC0060
Pages : 3 of 9

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	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

Continuation of Calibration Certificate

Cert. No. : ACL22114

Job No. : VC65AC0060

Pages : 4 of 9

Result of calibration :**1. Absolute sensitivity**

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
21.7

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

Frequency Weighting	Measured value (dB)
A - weight	21.5
C - weight	22.6
Flat	25.5

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.3	0.4	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.1	-1.0	-0.9	±5.0

Continuation of Calibration Certificate

Cert. No. : ACL22114
Job No. : VC65AC0060
Pages : 5 of 9

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	0.0	±2.0
125	-0.1	0.0	0.0	±1.5
250	-0.1	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.1	0.1	±2.0
4000	0.1	0.1	0.1	±3.0
8000	0.1	0.2	0.2	±5.0

5. Frequency and time weightings at 1 kHz**5.1 Frequency weightings at 1 kHz**

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Continuation of Calibration Certificate

Cert. No. : ACL22114
Job No. : VC65AC0060
Pages : 6 of 9

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	113.9	-0.1	± 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	49.1	0.1	± 1.1
44.0	44.1	0.1	± 1.1
39.0	39.4	0.4	± 1.1

Continuation of Calibration Certificate

Cert. No. : ACL22114

Job No. : VC65AC0060

Pages : 7 of 9

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.5
120	94.0	94.0	0.0	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	43.0	43.0	0.0	±0.5
120	33.0	33.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-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
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

Continuation of Calibration Certificate

Cert. No. : ACL22114
Job No. : VC65AC0060
Pages : 8 of 9

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	136.3	-0.1	±3.0

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

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.4	89.3	-0.1	±1.5

Continuation of Calibration Certificate

Cert. No. : ACL22114
Job No. : VC65AC0060
Pages : 9 of 9

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

SITHIPHORN ASSOCIATES CO.,LTD.

CALIBRATION LABORATORY



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

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : ACC22001

Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-75
Serial No.: 35002736
ID No.: - RY60496

Condition As Found : GOOD

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

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

Received Date : 05 JANUARY 2022
Calibration Date : 10 JANUARY 2022
Date of Issue : 13 JANUARY 2022

REVIEW BY	Narakorn P.
APPROVED BY	[Signature]
NEXT CAL. DATE	10/1/23

Calibrated by : Nathakorn Pisutpaisan

Approved by :

[Signature]
(Thanakul Petchurai)

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

Continuation of Calibration Certificate

Cert. No. : ACC22001

Job No. : VC65AC0040

Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-21	10-Feb-22

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

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

3.1 National Institute of Metrology (Thailand).

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

Continuation of Calibration Certificate

Cert. No. : ACC22001

Job No. : VC65AC0040

Pages : 3 of 3

Result of calibration :**1. Sound pressure level**

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	93.99	-0.01	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1000.0	0.0	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
0.28	0.10	3.0

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

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL22194

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00597168 / 179117 / 87524
ID No.: RYG_FS0438

Condition As Found : GOOD

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

Location : -

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

Received Date : 06 SEPTEMBER 2022
Calibration Date : 07-09 SEPTEMBER 2022
Date of Issue : 14 SEPTEMBER 2022

REVIEW BY	Nathakorn P.
APPROVED BY	[Signature]
NEXT CAL. DATE	4/9/23

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

[Signature]
(Thanakul Petchurai)

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Continuation of Calibration Certificate

Cert. No. : ACL22194

Job No. : VC65AC0081

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	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).

Continuation of Calibration Certificate

Cert. No. : ACL22194

Job No. : VC65AC0081

Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	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

Continuation of Calibration Certificate

Cert. No. : ACL22194

Job No. : VC65AC0081

Pages : 4 of 8

Result of calibration :**1. Absolute sensitivity**

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.1	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	1.7	1.8	1.8	±5.0

Continuation of Calibration Certificate

Cert. No. : ACL22194
Job No. : VC65AC0081
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	0.1	0.1	±2.0
4000	0.1	0.1	0.1	±3.0
8000	0.1	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Continuation of Calibration Certificate

Cert. No. : ACL22194

Job No. : VC65AC0081

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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.1	0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

Continuation of Calibration Certificate

Cert. No. : ACL22194
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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	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	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, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

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