

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Total Suspended Particulate	High Volume	RYG_FS0393	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0291	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0175	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0396	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0395	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	1-Mar-23	1-Mar-24	12
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0191	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0190	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0192	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0398	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0189	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	RYG_EN0001	1-Mar-23	1-Mar-24	12
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0459	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	BKK_FS0797	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0535	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0461	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0457	5-Jan-23	5-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0458	4-Jan-23	4-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	BKK_FS0796	4-Jan-23	4-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0534	4-Jan-23	4-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0460	4-Jan-23	4-Jul-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0456	4-Jan-23	4-Jul-23	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0611	17-Nov-22	17-May-24	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0215	31-Aug-22	31-Aug-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0016	11-Jul-22	11-Jul-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0022	25-Jan-23	25-Jan-24	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0023	13-Jan-23	13-Jan-24	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0300	11-Jul-22	11-Jul-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0301	18-Oct-22	18-Oct-23	12
Noise	Leq 5 min	Sound Calibrator	RYG_FS0215	31-Aug-22	31-Aug-23	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0016	11-Jul-22	11-Jul-23	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0022	25-Jan-23	25-Jan-24	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0023	13-Jan-23	13-Jan-24	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0300	11-Jul-22	11-Jul-23	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0301	18-Oct-22	18-Oct-23	12
Noise	Noise Annoyance	Sound Calibrator	RYG_FS0215	31-Aug-22	31-Aug-23	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0016	11-Jul-22	11-Jul-23	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0022	25-Jan-23	25-Jan-24	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0023	13-Jan-23	13-Jan-24	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0300	11-Jul-22	11-Jul-23	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0301	18-Oct-22	18-Oct-23	12
Noise	Noise Annoyance	Sound Calibrator	RYG_FS0215	31-Aug-22	31-Aug-23	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0031	20-Jun-22	20-Jun-23	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0492	13-Jan-23	13-Jan-24	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0493	13-Jan-23	13-Jan-24	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0494	13-Jan-23	13-Jan-24	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0495	13-Jan-23	13-Jan-24	12
Rayong Lab	Cyanide	SPECTROPHOTOMETER	RYG_EN0037	27-Sep-22	27-Mar-24	18
Rayong Lab	pH at 25 °C	pH meter	RYG_EN0183	27-Feb-23	27-Feb-24	12
Rayong Lab	Nitrate	Spectrophotometer	RYG_EN0037	27-Sep-22	27-Mar-24	18
Rayong Lab	Ammonia Nitrogen	SPECTROPHOTOMETER	RYG_EN0037	27-Sep-22	27-Mar-24	18
Rayong Lab	Dissolved Oxygen	Chamber (Cold Room)	RYG_EN0184	25-Jan-23	25-Jul-24	18
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	Temperature	Digital Thermometer With Sensor	RYG_FS0468	7-Sep-22	7-Sep-23	12
Rayong Lab	Ammonia Nitrogen	SPECTROPHOTOMETER	RYG_EN0037	27-Sep-22	27-Mar-24	18



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Rayong Lab	Color	Chamber (Cold Room)	RYG_EN0184	25-Jan-23	25-Jul-24	18
Rayong Lab	Fluoride	pH ISE Meter	RYG_EN0183	27-Feb-23	27-Feb-24	12
Rayong Lab	Sulfate	Spectrophotometer	RYG_EN0037	27-Sep-22	27-Mar-24	18
Rayong Lab	Turbidity	Chamber (Cold Room)	RYG_EN0184	25-Jan-23	25-Jul-24	18
Water Lab	Permanent Hardness	Burette	BKK_EN0171	30-Aug-22	1-Mar-24	18
Water Lab	Total Alkalinity	Burette	BKK_EN0171	30-Aug-22	1-Mar-24	18
Water Lab	Total Hardness	Burette	BKK_EN0171	30-Aug-22	1-Mar-24	18
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0002	8-Feb-23	8-Feb-24	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0273	29-Nov-22	29-May-24	18
Water Lab	Hexavalent Chromium	Spectrophotometer	BKK_EN0018	16-Sep-22	16-Sep-23	12
Water Lab	Aluminium	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Aluminium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Aluminium	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Lead	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Lead	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Lead	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Iron	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Iron	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Iron	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Manganese	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Manganese	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Manganese	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Copper	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Copper	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Copper	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Nickel	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Nickel	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Nickel	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Arsenic	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Arsenic	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Arsenic	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Barium	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Barium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Barium	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Chromium	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Chromium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Chromium	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Cadmium	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Cadmium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Cadmium	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Selenium	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Selenium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Selenium	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Silver	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Silver	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Silver	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Zinc	ICP-MS	BKK_EL0026	14-Jun-22	14-Dec-23	18
Water Lab	Zinc	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Zinc	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Mercury	DUO-CVAFS / CVAAS	BKK_EL0023	24-May-23	24-May-24	12
Water Lab	Chloride	Ion Chromatography	BKK_EN0069	12-Jan-23	12-Jan-24	12
Water Lab	<i>Escherichia coli</i>	Autoclave	BKK_ML0041	20-May-22	20-Nov-23	18
Water Lab	<i>Escherichia coli</i>	Incubator	BKK_ML0010	21-Jan-22	22-Jul-23	18
Water Lab	<i>Escherichia coli</i>	Hot Air Oven	BKK_ML0013	21-Nov-22	21-May-24	18
Water Lab	<i>Escherichia coli</i>	Water Bath	BKK_ML0056	20-Apr-23	20-Apr-24	12



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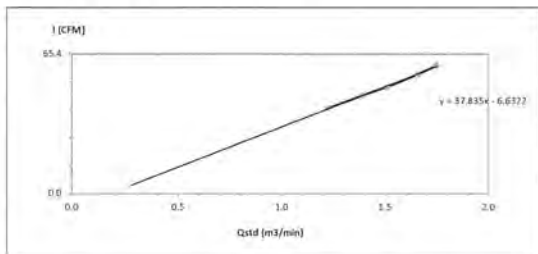
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Fecal Coliform	Autoclave	BKK_ML0041	20-May-22	20-Nov-23	18
Water Lab	Fecal Coliform	Incubator	BKK_ML0010	21-Jan-22	22-Jul-23	18
Water Lab	Fecal Coliform	Hot Air Oven	BKK_ML0013	21-Nov-22	21-May-24	18
Water Lab	Fecal Coliform	Water Bath	BKK_ML0056	20-Apr-23	20-Apr-24	12
Sludge	Silver	ICP-OES	BKK_EL0037	2-Mar-23	1-Mar-24	12
Sludge	Silver	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Sludge	Silver	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Sludge	Lead	ICP-OES	BKK_EL0037	2-Mar-23	1-Mar-24	12
Sludge	Lead	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Sludge	Lead	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Sludge	Mercury	DUO-CVAFS / CVAAS	BKK_EL0023	24-May-23	24-May-24	12
Sludge	Manganese	ICP-OES	BKK_EL0037	2-Mar-23	1-Mar-24	12
Sludge	Manganese	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Sludge	Manganese	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Sludge	Copper	ICP-OES	BKK_EL0037	2-Mar-23	1-Mar-24	12
Sludge	Copper	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Sludge	Copper	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Sludge	Nickel	ICP-OES	BKK_EL0037	2-Mar-23	1-Mar-24	12
Sludge	Nickel	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Sludge	Nickel	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Sludge	Arsenic	ICP-OES	BKK_EL0037	2-Mar-23	1-Mar-24	12
Sludge	Arsenic	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Sludge	Arsenic	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Sludge	Cadmium	ICP-OES	BKK_EL0037	2-Mar-23	1-Mar-24	12
Sludge	Cadmium	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Sludge	Cadmium	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Sludge	Zinc	ICP-OES	BKK_EL0037	2-Mar-23	1-Mar-24	12
Sludge	Zinc	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Sludge	Zinc	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Sludge	Hexavalent Chromium	Spectrophotometer	BKK_EN0018	16-Sep-22	16-Sep-23	12



High Volume Air Sampler Calibration Worksheet

Project Site: Rojana Industrial Park Public Co., Ltd. Barometric Pressure (mm Hg): 755
 Calibrate Location: สถานี A1 : วัดฝุ่นละอองรอบ Temperature (°C): 32
 Calibrate Date: 14-May-23 High Volume ID: RYG-FS0393
 Calibration Sheet No.: C-140523-RYG-FS0393 High Volume Model: TE-5170D
 Calibrator ID: RYG-FS0205 High Volume S/N: 5682
 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} (m³/min)	I : Chart (CFM)	Linear Regression
1	3.4	1.2254	40	Slope: 37.8348 Intercept: -6.6322 Correlation Coefficient: 0.9986
2	4.3	1.3911	46	
3	5.2	1.5106	50	
4	6.3	1.6606	56	
5	7.0	1.7493	60	



Calibrated by: P. Sirit Approved by: Mr. Noppong Jantarapan
 (Mr. Sriwit Ruangsom) (Enviro Field Coordinator Scientist (3))
 Field Scientist (1)

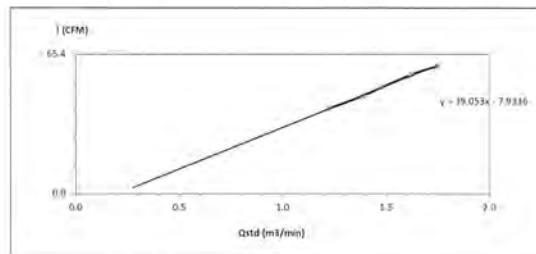
FORM NO.: F 06-073 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site: Rojana Industrial Park Public Co., Ltd. Barometric Pressure (mm Hg): 755
 Calibrate Location: สถานี A2 : วัดฝุ่นละออง Temperature (°C): 32
 Calibrate Date: 14-May-23 High Volume ID: RYG-FS0291
 Calibration Sheet No.: C-140523-RYG-FS0291 High Volume Model: TE-5170D
 Calibrator ID: RYG-FS0205 High Volume S/N: 5333
 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} (m³/min)	I : Chart (CFM)	Linear Regression
1	3.4	1.2254	40	Slope: 39.0529 Intercept: -7.0436 Correlation Coefficient: 0.9985
2	4.4	1.3911	46	
3	5.0	1.4816	50	
4	6.0	1.6211	56	
5	7.0	1.7493	60	



Calibrated by: P. Sirit Approved by: Mr. Noppong Jantarapan
 (Mr. Sriwit Ruangsom) (Enviro Field Coordinator Scientist (3))
 Field Scientist (1)

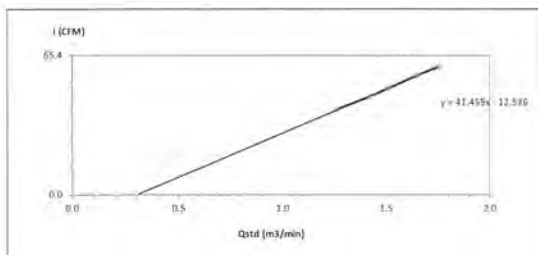
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High Volume Air Sampler Calibration Worksheet

Project Site: Rojana Industrial Park Public Co., Ltd. Barometric Pressure (mm Hg): 755
 Calibrate Location: สถานี A3 : วัดฝุ่นละอองรอบ Temperature (°C): 32
 Calibrate Date: 14-May-23 High Volume ID: RYG-FS0175
 Calibration Sheet No.: C-140523-RYG-FS0175 High Volume Model: TE-5170D
 Calibrator ID: RYG-FS0205 High Volume S/N: 4801
 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} (m³/min)	I : Chart (CFM)	Linear Regression
1	3.6	1.2603	40	Slope: 43.4547 Intercept: -12.5255 Correlation Coefficient: 0.9994
2	4.6	1.4220	46	
3	5.2	1.5106	50	
4	6.2	1.6475	56	
5	7.0	1.7493	60	



Calibrated by: P. Sirit Approved by: Mr. Noppong Jantarapan
 (Mr. Sriwit Ruangsom) (Enviro Field Coordinator Scientist (3))
 Field Scientist (1)

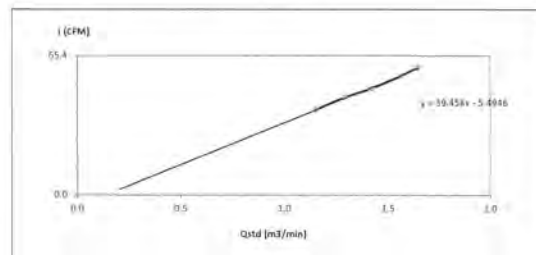
FORM NO.: F 06-073 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site: Rojana Industrial Park Public Co., Ltd. Barometric Pressure (mm Hg): 755
 Calibrate Location: สถานี A4 : วัดฝุ่นละออง Temperature (°C): 32
 Calibrate Date: 14-May-23 High Volume ID: RYG-FS0396
 Calibration Sheet No.: C-140523-RYG-FS0396 High Volume Model: TE-5170D
 Calibrator ID: RYG-FS0205 High Volume S/N: 5688
 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} (m³/min)	I : Chart (CFM)	Linear Regression
1	3.8	1.1523	40	Slope: 39.4578 Intercept: -5.4846 Correlation Coefficient: 0.9982
2	3.8	1.2943	46	
3	4.6	1.4220	50	
4	5.6	1.5668	56	
5	6.2	1.6475	60	



Calibrated by: P. Sirit Approved by: Mr. Noppong Jantarapan
 (Mr. Sriwit Ruangsom) (Enviro Field Coordinator Scientist (3))
 Field Scientist (1)

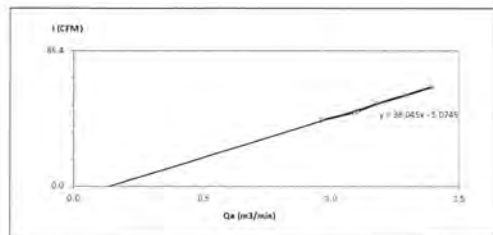
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High Volume Air Sampler Calibration Worksheet

Project Site: Rojana Industrial Park Public Co., Ltd. Barometric Pressure (mm Hg): 755
 Calibrate Location: ๙๐๖๘ AL : ๙๐๖๘๐๖ Temperature (°C): 32
 Calibrate Date: 14-May-23 High Volume ID: RYG-FS0190
 Calibration Sheet No.: C-140523-RYG-FS0190 High Volume Model: 61051
 Calibrator ID: RYG-FS0205 High Volume S/N: 1625
 Calibrator Model: TE-5028A Calibrator Slope: 0.94434
 Calibrator S/N: 1166 Calibrator Intercept: -0.01292

Test No.	Delta H ₂ O (inch)	Q _a (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	0.965	32	Slope: 30.0454 Intercept: -5.0749 Correlation Coefficient: 0.9478
2	2.6	1.098	36	
3	3.0	1.179	40	
4	3.6	1.298	44	
5	4.2	1.392	48	



Calibrated by: P. Sirit
 (Mr. Sarwet Ruangsom)
 Field Scientist (1)

Approved by: 2. Pong
 (Mr. Noppong Jantarapan)
 Enviro Field Coordinator Scientist (3)

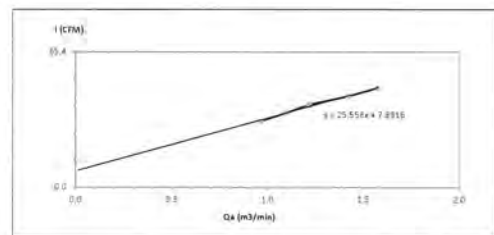
FORM NO. 3-B-074 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site: Rojana Industrial Park Public Co., Ltd. Barometric Pressure (mm Hg): 755
 Calibrate Location: ๙๐๖๘ AL : ๙๐๖๘๐๖ Temperature (°C): 32
 Calibrate Date: 14-May-23 High Volume ID: RYG-FS0192
 Calibration Sheet No.: C-140523-RYG-FS0192 High Volume Model: TE-5009X
 Calibrator ID: RYG-FS0205 High Volume S/N: 5331
 Calibrator Model: TE-5028A Calibrator Slope: -0.94434
 Calibrator S/N: 1166 Calibrator Intercept: -0.01292

Test No.	Delta H ₂ O (inch)	Q _a (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	0.965	32	Slope: 20.5579 Intercept: 1.0916 Correlation Coefficient: 0.9955
2	2.6	1.098	36	
3	3.0	1.177	40	
4	3.6	1.225	44	
5	4.2	1.577	48	



Calibrated by: P. Sirit
 (Mr. Sarwet Ruangsom)
 Field Scientist (1)

Approved by: 2. Pong
 (Mr. Noppong Jantarapan)
 Enviro Field Coordinator Scientist (3)

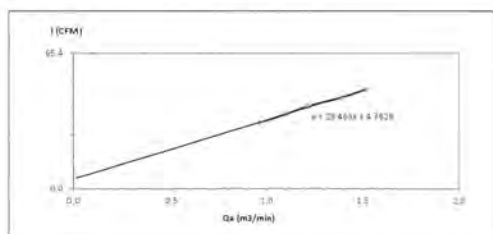
FORM NO. 3-B-074 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site: Rojana Industrial Park Public Co., Ltd. Barometric Pressure (mm Hg): 755
 Calibrate Location: ๙๐๖๘ AL : ๙๐๖๘๐๖ Temperature (°C): 32
 Calibrate Date: 14-May-23 High Volume ID: RYG-FS0190
 Calibration Sheet No.: C-140523-RYG-FS0190 High Volume Model: TE-5009X
 Calibrator ID: RYG-FS0205 High Volume S/N: 5084
 Calibrator Model: TE-5028A Calibrator Slope: 0.94434
 Calibrator S/N: 1166 Calibrator Intercept: -0.01292

Test No.	Delta H ₂ O (inch)	Q _a (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	0.965	32	Slope: 20.4629 Intercept: 1.1679 Correlation Coefficient: 0.9982
2	2.6	1.098	36	
3	3.0	1.177	40	
4	3.6	1.392	44	
5	5.0	1.510	48	



Calibrated by: P. Sirit
 (Mr. Sarwet Ruangsom)
 Field Scientist (1)

Approved by: 2. Pong
 (Mr. Noppong Jantarapan)
 Enviro Field Coordinator Scientist (3)

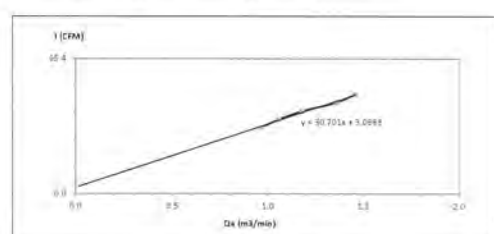
FORM NO. 3-B-074 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site: Rojana Industrial Park Public Co., Ltd. Barometric Pressure (mm Hg): 755
 Calibrate Location: ๙๐๖๘ AL : ๙๐๖๘๐๖ Temperature (°C): 32
 Calibrate Date: 14-May-23 High Volume ID: RYG-FS0189
 Calibration Sheet No.: C-140523-RYG-FS0189 High Volume Model: TE-5009X
 Calibrator ID: RYG-FS0205 High Volume S/N: 4797
 Calibrator Model: TE-5028A Calibrator Slope: 0.94434
 Calibrator S/N: 1166 Calibrator Intercept: -0.01292

Test No.	Delta H ₂ O (inch)	Q _a (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	0.965	32	Slope: 30.2009 Intercept: -1.0691 Correlation Coefficient: 0.9938
2	2.6	1.056	36	
3	3.0	1.179	40	
4	3.6	1.359	44	
5	4.6	1.456	48	



Calibrated by: P. Sirit
 (Mr. Sarwet Ruangsom)
 Field Scientist (1)

Approved by: 2. Pong
 (Mr. Noppong Jantarapan)
 Enviro Field Coordinator Scientist (3)

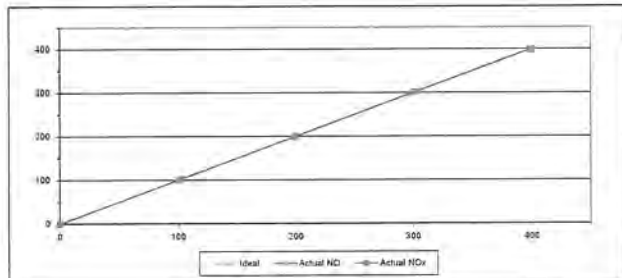
FORM NO. 3-B-074 REVISION NO.: ISSUE DATE: 14/03/16



MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-23 Equipment Name NOx Analyzer
 Manufacturer HORIBA Model APNA-370
 Serial No. NV0ER3YH Equipment ID RYG_FS0459
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.88 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Airgas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.50	-0.50	-0.50	101.80	1.80	1.80
2	200.00	198.70	-1.30	-0.65	199.70	-0.30	-0.15
3	300.00	301.10	1.10	0.37	301.50	1.50	0.50
4	400.00	401.30	1.30	0.33	399.90	-1.10	-0.28
AVERAGE (%)				-0.08			0.39



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

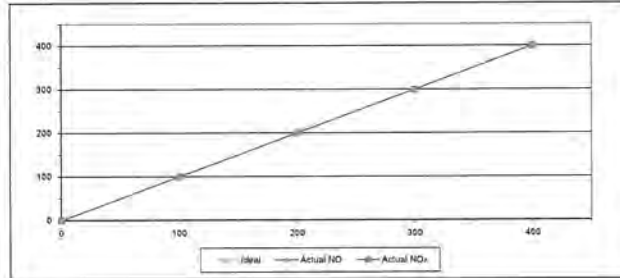
ALS Laboratory Group
FORM NO. F-06-058 REVISION NO. - ISSUE DATE 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-23 Equipment Name NOx Analyzer
 Manufacturer HORIBA Model APNA-370
 Serial No. H73KYD1M Equipment ID BKK_FS0797
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.88 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Airgas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	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
2	200.00	198.60	-1.40	-0.70	201.30	1.30	0.65
3	300.00	299.00	-1.00	-0.33	299.20	-0.80	-0.27
4	400.00	402.10	2.10	0.53	399.50	-0.50	-0.13
AVERAGE (%)				-0.14			0.27



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

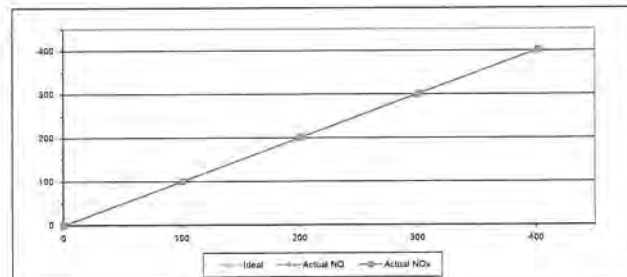
ALS Laboratory Group
FORM NO. F-06-058 REVISION NO. - ISSUE DATE 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-23 Equipment Name NOx Analyzer
 Manufacturer Teledyne API Model T200
 Serial No. 7239 Equipment ID RYG_FS0535
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.88 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Airgas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	101.00	1.00	1.00
2	200.00	199.30	-0.70	-0.35	201.10	1.10	0.55
3	300.00	298.80	-1.20	-0.40	301.50	1.50	0.50
4	400.00	398.20	-1.80	-0.45	402.30	2.30	0.58
AVERAGE (%)				-0.40			0.55



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

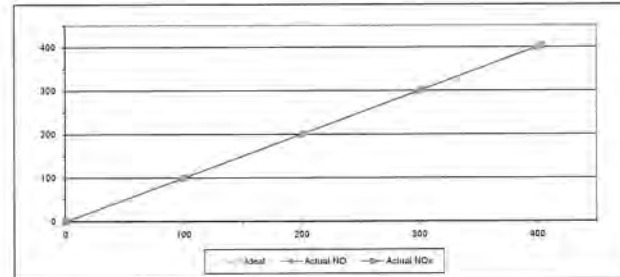
ALS Laboratory Group
FORM NO. F-06-058 REVISION NO. - ISSUE DATE 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-23 Equipment Name NOx Analyzer
 Manufacturer HORIBA Model APNA-370
 Serial No. T95HWM41 Equipment ID RYG_FS0461
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.88 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Airgas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30	100.10	0.10	0.10
2	200.00	201.00	1.00	0.50	201.40	1.40	0.70
3	300.00	299.30	-0.70	-0.23	302.10	2.10	0.70
4	400.00	398.40	-1.60	-0.40	403.50	3.50	0.88
AVERAGE (%)				-0.33			0.50



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

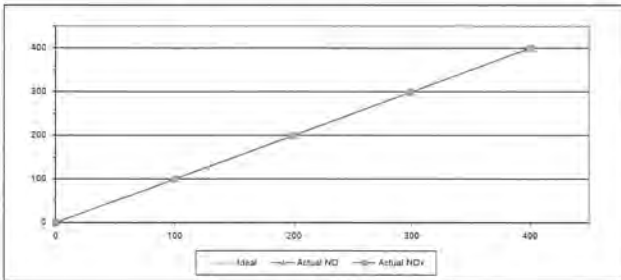
ALS Laboratory Group
FORM NO. F-06-058 REVISION NO. - ISSUE DATE 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-23 Equipment Name NOx Analyzer
 Manufacturer HORIBA Model APNA-370
 Serial No. T2T8YRLL Equipment ID RYG_FS0457
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.68 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Airgas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.30	-1.70	-1.70	100.20	0.20	0.20
2	200.00	198.40	-1.60	-0.80	199.60	-0.40	-0.20
3	300.00	297.10	-2.90	-0.97	298.50	-1.50	-0.50
4	400.00	398.60	-1.40	-0.35	400.70	0.70	0.17
AVERAGE (%)				-0.74			-0.05



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

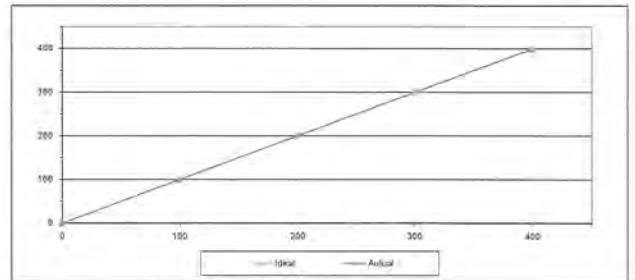
ALS Laboratory Group
FORM NO. 1-05-050 REVISION NO. ISSUE DATE 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jan-23 Equipment Name SO2 Analyzer
 Manufacturer HORIBA Model APSA-370
 Serial No. PAUY077A Equipment ID RYG_FS0458
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.3 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Airgas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.90	-1.10	-1.10
2	200.00	201.10	1.10	0.55
3	300.00	302.30	2.30	0.77
4	400.00	398.60	-1.40	-0.35
AVERAGE (%)				-0.01



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

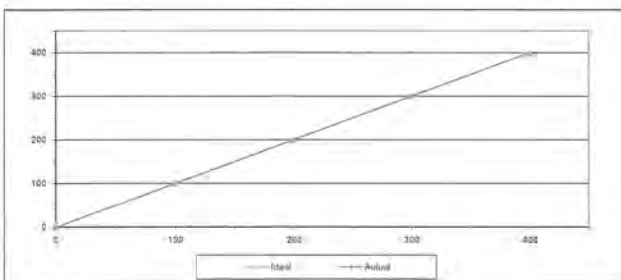
ALS Laboratory Group
FORM NO. 1-05-050 REVISION NO. ISSUE DATE 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jan-23 Equipment Name SO2 Analyzer
 Manufacturer HORIBA Model APSA-370
 Serial No. G2CH436B Equipment ID BKK_FS0798
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.3 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Airgas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	98.91	-1.09	-1.09
2	200.00	198.10	-1.90	-0.95
3	300.00	298.10	-1.90	-0.63
4	400.00	395.60	-4.40	-1.10
AVERAGE (%)				-0.74



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

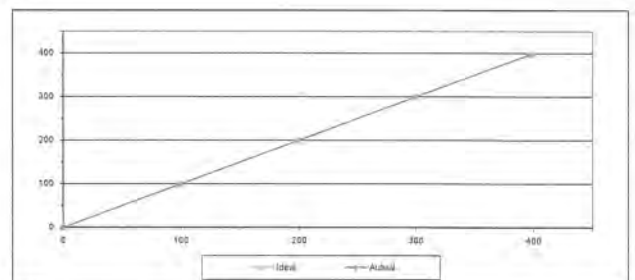
ALS Laboratory Group
FORM NO. 1-05-050 REVISION NO. ISSUE DATE 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jan-23 Equipment Name SO2 Analyzer
 Manufacturer Teledyne API Model T100
 Serial No. 5061 Equipment ID RYG_FS0534
 Calibrator Manufacturer Teledyne API Model 700
 Serial No. 947
 Std. Gas Concentration (PPM) 55.3 Cylinder No. GN0027222
 Cylinder Pressure (psi) 1800 Certified By Airgas Inc.
 Certified Date 9-Feb-22 Expired Date 9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.60	-1.20	-1.20
2	200.00	198.70	-1.30	-0.65
3	300.00	298.30	-1.70	-0.57
4	400.00	397.30	-2.70	-0.67
AVERAGE (%)				-0.60



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantont)
Assistant General Manager

ALS Laboratory Group
FORM NO. 1-05-050 REVISION NO. ISSUE DATE 02/04/12



JANITEX ASSOCIATES CO., LTD.
53/14, 15, 16/35 36,
Wattana, Bangkoko, Bangkok 10600, Thailand
Tel: 02-8680812 Fax: 02-8680860
E-mail: jn@janitex.co.th
Web: www.janitex.co.th

Accredited calibration laboratory
ISO/IEC 17025:2017
MSC 101:2015 (2020)
CERTIFICATION 0367

An ISO/IEC 17025:2017
Certification number 0367

Certificate Number

CL-004-65

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS RECEIVED

CUSTOMER

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

ENVIRONMENTAL CONDITIONS

Temperature

Relative Humidity

Atmospheric Pressure

PLACE OF CALIBRATION

CALIBRATION CONDITIONS

Preconditioning

Measurement Condition

TABULATION OF RESULTS

The table on next page give the measured values

Calibrated by

Checked by

Remarks

1. Square cross-section area of the wind tunnel

2. Suggested cross-section area of the tested object inside measurement

3. Diameter of mounting pipe

4. Ratio of test

Cup anemometer

Novelty

Sensor: WS-021

Data logger: L10 WS-2505-D

Sensor: WS-021

Data logger: AS-017

AYG-150611

New Item

AS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanasirakul 40, Phatthanasirakul Rd., Khwaeng Suan Luang,

Khet Suan Luang, Bangkok 10250 Thailand

50 Nov 2022

17 Nov 2022

23 Nov 2022

23.0 ± 0.3 °C

55.0 ± 15.0 %RH

1020.10 hPa

Effel tube wind tunnel of Janitex Associates Co., Ltd.

Wind tunnel cross-section area¹

Win direction horizontal area²

Diameter of mounting pipe³

Ratio of test object⁴

900 mm²

100 mm²

0.111

24 hours at ambient condition

The average values during measurement are (23.0) °C, (55.0) %RH and (1020.1) hPa

The table on next page give the measured values

Calibrated by

Checked by

Remarks

1. Square cross-section area of the wind tunnel

2. Suggested cross-section area of the tested object inside measurement

3. Diameter of mounting pipe

4. Ratio of test



Approved Signatory

Mr. Pongthorn Pongthorn
Calibration Department Manager

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

Certificate Number

CL-004-65

Page 2 of 2 Pages

MEASUREMENT RESULTS

The cup anemometer, Unit Under Calibration (UUC) was calibrated at 10 m/s. An 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity (standard) and above 5 m/s to 30 m/s was calculated by a pitot tube with pressure differential pressure meter which was installed 40 mm and 360 mm respectively away from wind tunnel nozzle. UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 30 m/s as calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

UUC [m/s]	Temp. wind tunnel [°C]	Temp. room [°C]	UUC [m/s]	Error [m/s]	U(U+2) [m/s]
0.988	23.20	23.80	0.8	0.2	0.15
2.053	23.80	23.80	1.8	0.2	0.16
3.046	23.84	23.80	2.8	0.2	0.18
4.227	23.86	23.80	3.8	0.4	0.19
5.02	23.70	23.80	4.8	0.3	0.19
6.02	23.84	23.80	5.8	0.3	0.18
7.07	23.70	23.80	6.8	0.2	0.18
8.15	23.50	23.80	7.8	0.3	0.20
9.22	23.60	23.80	8.8	0.2	0.19
10.12	23.62	23.80	9.8	0.3	0.20
11.16	23.50	23.80	10.8	0.3	0.21
12.15	23.50	23.80	11.8	0.4	0.21
13.21	23.48	23.80	12.8	0.3	0.21
14.27	23.74	23.80	13.8	0.4	0.21
15.26	23.56	23.80	14.8	0.3	0.23
16.32	23.62	23.80	16.0	0.3	0.26

Remark:

Calibration results only valid for the listed characteristics and environmental conditions during which calibration took place.

Version of standard

Version of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the cup anemometer calibration in the wind tunnel of Janitex Associates Co., Ltd. The cup anemometer shown may differ from the calibration one. The position of the set-up is not true to scale due to cropping proximity.



63/14 15,6,7/35 36, Soi Petchasam 7/11, Petchasam Rd.
Wattana, Bangkok, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.janitex.co.th

CERTIFICATE OF CALIBRATION

Calibration No. BB114112022

Page 1 of 2 Pages

Measurement Item

Manufacturer

Model/Type

Serial Number

SI No.

Customer

Pressure, humidity, wind speed

Novelty

L10 WS-2505-D

AYG-017

1111122022

AS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanasirakul 40, Phatthanasirakul Rd., Khwaeng Suan Luang,

Khet Suan Luang, Bangkok 10250 Thailand

Environmental Condition

The measurement was carried out at an ambient temperature of (23.0) °C and relative humidity of (55.0) %RH.

Measurement Method

The Unit Under Calibration (UUC) was calibrated by comparison method with reference from a pressure sensor in the humidity generator chamber to determine the error.

Traceability

The instrument was calibrated using standard equipment whose accuracy is traceable through National Institute of Standards and Technology to the International system of units (SI) via NIST Calibration No. 20314101. Our meter No. 142093.

Measurement Date

Revised Date

Nov 18, 2022

Nov 23, 2022

Measurement Results

This equipment was compared with full air velocity probe and provided with an average value of (10.0) m/s. Result number: 03011247

Calibration was performed in the range of (0.000) to (30.000) m/s

The results of calibration are reported in table below

Determined [m/s]	Standard [m/s]	UUC Error [m/s]	Error [m/s]	Uncertainty [m/s]
20	19.97	0.03	0.3	0.51
30	29.95	0.05	0.3	0.51
40	39.93	0.07	0.3	0.51

Performed by

Checked by

Remarks



Approved Signatory

Mr. Pongthorn Pongthorn
Calibration Department Manager

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



63/14 15,6,7/35 36, Soi Petchasam 7/11, Petchasam Rd.
Wattana, Bangkok, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.janitex.co.th

CALIBRATION REPORT

Calibration Number: BB114112022

Page 1 of 2 Pages

Measurement Item

Manufacturer

Model/Type

Serial Number

SI No.

Customer

New, compare with full air velocity probe

Novelty

L10 WS-2505-D

AYG-017

1111122022

AS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanasirakul 40, Phatthanasirakul Rd., Khwaeng Suan Luang,

Khet Suan Luang, Bangkok 10250 Thailand

Environmental Condition

The measurement was carried out at an ambient temperature of (23.0) °C and relative humidity of (55.0) %RH.

Measurement Method

The Unit Under Calibration (UUC) was calibrated by comparison method with reference from a pressure sensor in the humidity generator chamber to determine the error.

Traceability

The instrument was calibrated using standard equipment whose accuracy is traceable through National Institute of Standards and Technology to the International system of units (SI) via NIST Calibration No. 20314101. Our meter No. 142093.

Measurement Date

Revised Date

Nov 18, 2022

Nov 23, 2022

Measurement Results

This equipment was compared with full air velocity probe and provided with an average value of (10.0) m/s. Result number: 03011247

Calibration was performed in the range of (0.000) to (30.000) m/s

The results of calibration are reported in table below

Determined [m/s]	Standard [m/s]	UUC Error [m/s]	Error [m/s]	Uncertainty [m/s]
20	19.97	0.03	0.3	0.51
30	29.95	0.05	0.3	0.51
40	39.93	0.07	0.3	0.51

Performed by

Checked by

Remarks



Approved Signatory

Mr. Pongthorn Pongthorn
Calibration Department Manager

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



Thailand Calibration Laboratory
NSC-TIS 17025-2017
NSC-TIS 17025
CALIBRATION 0367



NSC-TIS 17025
CALIBRATION 0367

Thailand Calibration Laboratory
NSC-TIS 17025-2017
NSC-TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. T1 012 05

Page 2 of 2 Pages

MEASUREMENT RESULTS

(Without adjustment) (With adjustment)

CALIBRATION IN THE RANGE OF

95% 10% min

The results of calibration and associated measurements and estimates are reported in the table below.

STD	UNC	Error	Uncertainty (k=2)
(mbar)	(mbar)	(mbar)	(mbar)
950.00	0.56	0.6	0.83
970.00	0.56	0.6	0.85
990.00	0.56	0.6	0.85
1010.00	0.56	0.6	0.86
1030.00	0.56	0.6	0.86
1050.00	0.56	0.6	0.86

Note: UNC = 1mm Under Calibration
To convert, the result in report unit to mm should be multiplied by 100.

"End of certificate"



SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-45/1 Sirinthorn Rd., Bangbunru, Bangpu Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



NSC-TIS-17025
CALIBRATION 0364

Cert. No. : ACC22023
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No. : 34178123
ID No. : RYG_FS0215

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHWAENG PHATTANAKAN, 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 : 22 AUGUST 2022
Calibration Date : 31 AUGUST 2022
Date of Issue : 02 SEPTEMBER 2022

Calibrated by : Nuthakorn Pitsupaisan

Approved by : *T. Petchum*
(Thanakul Petchum)

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QF-TS12-04-04-020664

SITHIPORN / SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22023
Job No. : VC65AC0077
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 :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	ET-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04-0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_05-0265	09-Feb-23
Digital Multimeter	33461A	MY00026273	EEL-BP_05-0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	ET-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	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).

QF-TS12-04-04-020664

T. Petchum

SITHIPORN / SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22023
Job No. : VC65AC0077
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	94.04	0.04	0.14	0.40

2. Frequency

Specified frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1001.5	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.70	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

QF-TS12-04-04-020664

T. Petchum

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL22162
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 0122567 / 143473 / 22605
ID No. : RYG FS0016

Condition As Found : GOOD

Customer : A.I.S LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, 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 : 06 JULY 2022
Calibration Date : 11-18 JULY 2022
Date of Issue : 19 JULY 2022

Calibrated by : Nulhakorn Pisunpisan

Approved by :

T. Petchai
(Thianakul Petchai)

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QF-TS12-04-04-020661

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22162
Job No. : VC65AC0069
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 :

Instrument	Model	Serial No.	Cert. No.	Due Date
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-42KA1	34560595	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).

QF-TS12-04-04-020661

T. Petchai

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22162
Job No. : VC65AC0069
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

QF-TS12-04-04-020661

T. Petchai

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22162
Job No. : VC65AC0069
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)
15.7

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

Frequency Weighting	Measured value (dB)
A-weight	12.6
C-weight	18.7
Flat	24.5

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	0.2	0.2	0.2	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-1.0	-0.9	-0.9	± 0.5

QF-TS12-04-04-020661

T. Petchai

Continuation of Calibration Certificate

Cert. No. : ACL22162
Job No. : VC65AC0069
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	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
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	-
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
1eq	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

Continuation of Calibration Certificate

Cert. No. : ACL22162
Job No. : VC65AC0069
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	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QP-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22162
Job No. : VC65AC0069
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, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -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	128.1	0.1	±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	136.0	-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	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QP-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22162
Job No. : VC65AC0069
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.7	89.5	-0.2	±1.5

12. High level stability

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

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

End of Calibration Certificate

QP-TS12-04-04-020664

T. Petch

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL23086
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 01222723 / 143841 / 22770
ID No. : RYG, FS0022

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUWAENG PHATTHANAKAN, 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 : 24 JANUARY 2023
Calibration Date : 25-26 JANUARY 2023
Date of Issue : 27 JANUARY 2023

Calibrated by : Natthakorn Proumpaisan

Approved by : *T. Petchuraj*
(Thenakul Petchuraj)

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
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 :

Instrument	Model	Serial No.	Cert. No.	Due Date
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-42KA1	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).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
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	12.0
C-weight	18.3
Flat	24.0

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	0.5	0.5	0.6	± 1.5
1000	0.0	-0.1	-0.1	± 1.0
8000	-0.1	0.0	0.0	± 1.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz.)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	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
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 weighting at 1 kHz

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

6. Long-term stability

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

QF-TS12-04-04-020664

T. Rith

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
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
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.8	-0.2	±1.1

QF-TS12-04-04-020664

T. Rith

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
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

Tone Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -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 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	136.1	-0.3	±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	135.2	-0.2	±2.0

QF-TS12-04-04-020664

T. Rith

Continuation of Calibration Certificate

Cert. No. : ACL23086
Job No. : VC66AC0031
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	89.5	-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

QF-TS12-04-04-020664

T. Rith

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL23048
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 01222724 / 143842 / 22771
ID No.: RYG_FS0023

Condition As Found : GOOD

Customer : A.I.S. LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHWAENG 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 : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023

Calibrated by : Nathakorn Pitsupavan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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QI-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23048
Job No. : VC66AC0024
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 :

Instrument	Model	Serial No.	Cert. No.	Due Date
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	ET-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	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).

QI-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23048
Job No. : VC66AC0024
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	✓	-	0.3	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QI-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23048
Job No. : VC66AC0024
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)
15.4

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

Frequency Weighting	Measured value (dB)
A-weight	11.2
C-weight	17.6
Flat	23.4

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-0.8	-0.8	-0.7	±5.0

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Continuation of Calibration Certificate

Cert. No. : ACL23048
Job No. : VC66AC0024
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	-0.1	-0.1	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
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 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

QI-TS12-04-04-020664

P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL23048
Job No. : VC66AC0024
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	48.9	-0.1	±1.1
44.0	43.9	-0.1	±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
29.0	28.8	-0.2	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.8	-0.2	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.8	-0.2	±1.1

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P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL23048
Job No. : VC66AC0024
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, 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	124.0	124.0	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

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	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QI-TS12-04-04-020664

P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL23048
Job No. : VC66AC0024
Pages : 8 of 8

11. Overload indication

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

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

QI-TS12-04-04-020664

P.T.A.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Silinthorn Rd., Bangbunmi, Bangkok 10700 THAILAND
Tel:0-2435-8600 Fax:0-2431-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No.: ACL22161
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00572561 / 170398 / 72899
ID No.: RYG F50300

Condition As Found : GOOD

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

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 2) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 06 JULY 2022
Calibration Date : 11/18 JULY 2022
Date of Issue : 19 JULY 2022

Calibrated by : Nathakorn Prasitpaisan

Approved by :

T. Petchumai
(Thitakul Petchumai)

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22161
Job No. : VC65AC0069
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:

Instrument	Model	Serial No.	Cert. No.	Due Date
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	2977960	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).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22161
Job No. : VC65AC0069
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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22161
Job No. : VC65AC0069
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)
16.2

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

Frequency Weighting	Measured value (dB)
A-weight	12.0
C-weight	18.3
Flat	24.2

3. Acoustical signal tests of frequency weightings

Meier 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	0.0	0.0	0.0	± 1.0
8000	0.4	0.5	0.5	± 5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22161
Job No. : VC65AC0069
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	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
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 weighting at 1 kHz

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

6. Long-term stability

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22161
Job No. : VC65AC0069
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	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22161
Job No. : VC65AC0069
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 ; -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
	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, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-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	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22161
Job No. : VC65AC0069
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.7	89.5	-0.2	±1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



ISO-15187:2015
CALIBRATION 0194

Cert. No. : ACL22231
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00472126 / 176915 / 88180
ID No. : RYG-FS0301

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHWAENG 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 : 03 OCTOBER 2022
Calibration Date : 18-19 OCTOBER 2022
Date of Issue : 20 OCTOBER 2022

Calibrated by : Nathakorn Pisunpaisan

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.

QP-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22231
Job No. : VC65AC0088
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 :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52502742	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-42KA1	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-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22231
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				
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	✓	-	0.2	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QP-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22231
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 (93.95)	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	9.9
C-weight	16.7
Flat	22.5

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-7.6	-7.6	-7.3	±1.5
1000	0.5	0.5	0.5	±1.0
8000	-5.1	-5.1	-5.1	±5.0

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22231
Job No. : VC65AC0088
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative in 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	-0.1	±1.5
250	0.0	-0.1	-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	0.1	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	SIM Display at initial (dB)	SIM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

QT-TS12-04-04-020664

T. P. P.

Continuation of Calibration Certificate

Cert. No. : ACL22231
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	± 1.1
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	131.9	-0.1	± 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	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QT-TS12-04-04-020664

T. P. P.

Continuation of Calibration Certificate

Cert. No. : ACL22231
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)
All in	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 ; -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
	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 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	136.4	0.0	± 3.0

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

QT-TS12-04-04-020664

T. P. P.

Continuation of Calibration Certificate

Cert. No. : ACL22231
Job No. : VC65AC0088
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	SIM Display at initial (dB)	SIM 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

QT-TS12-04-04-020664

T. P. P.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd., Bangsumru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2455-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22154
Pages : 1 of 8

Calibration Certificate

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

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUWAENG PHATTHANAKAN, 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 JUNE 2022
Calibration Date : 20-22 JUNE 2022
Date of Issue : 27 JUNE 2022

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.

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22154
Job No. : VC65AC0068
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 :

Instrument	Model	Serial No.	Cert. No.	Due Date
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-42KAJ	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).

QF-TS12-04-04-020664

T. Petchurai

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22154
Job No. : VC65AC0068
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	0.25
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

T. Petchurai

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22154
Job No. : VC65AC0068
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)
70.1

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	17.4
Flat	23.1

5. 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	0.5	0.5	0.5	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.5	-1.5	-1.4	± 5.0

QF-TS12-04-04-020664

T. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACL22154
Job No. : VC65AC0068
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	0.0	±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	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22154
Job No. : VC65AC0068
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	128.9	-0.1	± 1.1
124.0	123.9	-0.1	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22154
Job No. : VC65AC0068
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	Tone burst duration, Th (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -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 sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value; L _{Cpeak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	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	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22154
Job No. : VC65AC0068
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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



451-451/1 Srinidrom Rd., Banglumnu, Bangkok 10700 THAILAND
Tel: 0-2433-8800 Fax: 0-2433-1679 e-mail: center@sithiporn.com http://www.sithiporn.com

Cert. No. : ACL23042
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00900071 / 188464 / 01733
ID No.: RYG_FS0492

Condition As Found : GOOD

Customer : AJS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN 40, PHATTANAKAN ROAD,
KHWAENG PHATTANAKAN, KHET SUAN TANG,
BANGKOK, 10250 THAILAND.

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

Received Date : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurani
(Thunakul Petchurani)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23042
Job No. : VC66AC0024
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 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	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	FF-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-42KA1	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).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23042
Job No. : VC66AC0024
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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23042
Job No. : VC66AC0024
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.05)	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	11.6
C-weight	17.9
Flat	23.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.3	0.4	0.4	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23042
Job No. : VC66AC0024
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

QI-TS12-04-04-020664

R. L. A.

Continuation of Calibration Certificate

Cert. No. : ACL23042
Job No. : VC66AC0024
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	43.9	-0.1	± 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
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.8	-0.2	± 1.1
26.0	25.8	-0.2	± 1.1
25.0	24.8	-0.2	± 1.1

QI-TS12-04-04-020664

R. L. A.

Continuation of Calibration Certificate

Cert. No. : ACL23042
Job No. : VC66AC0024
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 ; -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

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	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QI-TS12-04-04-020664

R. L. A.

Continuation of Calibration Certificate

Cert. No. : ACL23042
Job No. : VC66AC0024
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	89.6	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

QI-TS12-04-04-020664

R. L. A.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd., Bangburm, Bangkok 10700 THAILAND
Tel: 2435-8800 Fax: 2435-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23043
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00900072 / 188465 / 01734
ID No.: RYG F80493

Condition As Found : GOOD

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

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

Received Date : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023

Calibrated by : Nathakorn Pitsurpaen

Approved by : *T. Petchum*
(Thanakul Petchum)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23043
Job No. : VC66AC0024
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 :

Instrument	Model	Serial No.	Cert. No.	Due Date
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	MA1-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	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).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23043
Job No. : VC66AC0024
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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23043
Job No. : VC66AC0024
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)
14.2

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	17.2
Flat	22.9

3. Acoustical signal tests of frequency weightings

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

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23043
Job No. : VC66AC0024
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	-0.1	0.0	-0.1	±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	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

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

QP-TS12-04-04-020664

T. Ratan

Continuation of Calibration Certificate

Cert. No. : ACL23043
Job No. : VC66AC0024
Pages : 6 of 8

7. Level linearity on the reference level range

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

QP-TS12-04-04-020664

T. Ratan

Continuation of Calibration Certificate

Cert. No. : ACL23043
Job No. : VC66AC0024
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, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -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

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	136.4	0.0	±3.0

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

QP-TS12-04-04-020664

T. Ratan

Continuation of Calibration Certificate

Cert. No. : ACL23043
Job No. : VC66AC0024
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

This 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. Ratan

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL23044
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00900073 / 188466 / 01735
ID No.: RYG_FS0494

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUWAENG PHATTHANAKAN, 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 : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023

Calibrated by : Nathakorn Pisulpattana

Approved by :

(Thanakul Petchumai)

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QI-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23044
Job No. : VC66AC0024
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 :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
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. 05/0265	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-42KA1	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).

QI-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23044
Job No. : VC66AC0024
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

QI-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23044
Job No. : VC66AC0024
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)
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	23.7

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at 0 level of 94 dB

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

QI-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23044
Job No. : VC66AC0024
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	0.0	±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

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

QF-TS12-04-03-020664

7. P.T.H.

Continuation of Calibration Certificate

Cert. No. : ACL23044
Job No. : VC66AC0024
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	119.1	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
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-03-020664

7. P.T.H.

Continuation of Calibration Certificate

Cert. No. : ACL23044
Job No. : VC66AC0024
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, 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	134.1	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, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.1	-0.3	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	132.9	-0.1	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-03-020664

7. P.T.H.

Continuation of Calibration Certificate

Cert. No. : ACL23044
Job No. : VC66AC0024
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-03-020664

7. P.T.H.

SITHIPORN 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@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL23045
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00900074 / 188467 / 01736
ID No.: RYG_FS0495

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHUWAENG PHATTHANAKAN, 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 : 06 JANUARY 2023
Calibration Date : 13-18 JANUARY 2023
Date of Issue : 19 JANUARY 2023

Calibrated by : Nathakorn Pitsutaporn

Approved by :

T. Petchum
(Thanakul 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.

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23045
Job No. : VC66AC0024
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 :

Instrument	Model	Serial No.	Cert. No.	Due Date
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	MA1-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	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 as :

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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23045
Job No. : VC66AC0024
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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23045
Job No. : VC66AC0024
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)
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	9.9
C-weight	16.8
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)			
	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	-2.0	-1.9	-1.9	± 5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23045
Job No. : VC66AC0024
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	-0.1	-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 weighting at 1 kHz

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

6. Long-term stability

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

QF-TS12-04-04-020664

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Continuation of Calibration Certificate

Cert. No. : ACL23045
Job No. : VC66AC0024
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	137.1	0.1	±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
129.0	129.1	0.1	±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	109.1	0.1	±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	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.8	-0.2	±1.1

QF-TS12-04-04-020664

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Continuation of Calibration Certificate

Cert. No. : ACL23045
Job No. : VC66AC0024
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 ; -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
	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 sound level

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

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

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Continuation of Calibration Certificate

Cert. No. : ACL23045
Job No. : VC66AC0024
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	89.5	-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

QF-TS12-04-04-020664

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Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1627845 (RYG_EN0037)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06220464
Issued Date: 27 September 2022
Job No.: KSPR2212224
Page: 1 of 3

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

REVIEW BY: *[Signature]*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 27/13/24

Environment Condition: Temperature 23.1 °C ±
Humidity 65.4 %RH ± 3.2 %RH

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

Calibration By: Mr. Chutaphon Fothong
Calibration Date: 27 September 2022
The Method used: In house method, CAL-WI-24, base on ASTM E 275-06 and ASTM E 387-04

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

The standard for Wavelength Certificate No. 91418 and 91435
The standard for Photometric Certificate No. 91441 and 101068
The standard for Stray light Certificate No. 101041 and 101040
The standard for Spectral resolution Certificate No. 101037

[Signature]
(Mr. Chutaphon Fothong)
Person in charge

[Signature]
(Mr. Thalekhaat Pongnam)
Authorized signatory

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

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

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

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Thailand 10260
Phone: +66 255 7050 Email: info@dksh.com Website: www.dksh.com

Delivering Growth - In Asia and Beyond

CAL-FM-C06-13: 20 Jul 2022



Certificate No.: C06220464 Page 2 of 3

Calibration Results: Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of filter at 2 nm and UUC at 2 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.61	418.4	0.21	0.14	
536.86	536.7	-0.04	0.14	
537.96	538.3	-0.32	0.14	
748.48	748.8	-0.32	0.14	
807.02	807.4	-0.37	0.13	

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5605	0.563	-0.0025	0.0045
	0.7334	0.737	-0.0036	0.0045
440 nm	1.0534	1.057	-0.0036	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5503	0.553	-0.0027	0.0045
465 nm	0.7179	0.720	-0.0021	0.0045
	1.0312	1.034	-0.0028	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5024	0.506	-0.0036	0.0045
	0.6693	0.672	-0.0027	0.0045
590 nm	0.9604	0.964	-0.0036	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5168	0.519	-0.0022	0.0045
656.1 nm	0.8903	0.891	-0.0007	0.0045
	0.9604	0.962	-0.0016	0.0045
	0.0000	0.000	0.0000	0.0045
680 nm	0.5525	0.554	-0.0015	0.0045
	0.7175	0.718	-0.0005	0.0045
	1.0301	1.031	-0.0009	0.0045
835 nm	0.0000	0.000	0.0000	0.0045
	0.5357	0.538	-0.0013	0.0045
	0.6847	0.685	-0.0003	0.0045
982 nm	0.9823	0.983	-0.0007	0.0045

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Thailand 10260
Phone: +66 255 7050 Email: info@dksh.com Website: www.dksh.com

Delivering Growth - In Asia and Beyond

CAL-FM-C06-13: 20 Jul 2022



Certificate No.: C06220464 Page 3 of 3

Calibration Results: Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7423	0.744	-0.0017	0.0083
257 nm	0.0000	0.000	0.0000	0.0080
	0.8509	0.851	-0.0001	0.0084
313 nm	0.0000	0.000	0.0000	0.0080
	0.2895	0.292	-0.0025	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6381	0.638	0.0001	0.0080

Stray light *			
Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%)	Absorbance (A)
260.67 +/- 0.11 nm	260.7	±1	1.678
391.94 +/- 0.11 nm	391.9	±1	1.770

Spectral Resolution *				
Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	BBW
Standard Wavelength (nm)	268.60	266.63	1.39	2.00
UUC: Wavelength (nm)	268.2	266.1		
Std Absorbance (A)	0.4810	0.3178		
Absorbance (A)	0.373	0.268		

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

The End of Certificate

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Thailand 10260
Phone: +66 255 7050 Email: info@dksh.com Website: www.dksh.com

Delivering Growth - In Asia and Beyond

CAL-FM-C06-13: 20 Jul 2022



ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2212224

ชนิดเครื่องวัด: SPECTROPHOTOMETER รุ่น: DR6000 หมายเลขเครื่อง: 1627845

ตรวจสอบ (วัน)		รายการตรวจเช็ค		ตรวจสอบ (ผู้)		หมายเหตุ
27 Sep 2022				27 Sep 2022		
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ			
General						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายในของเครื่อง)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตซ์ ปิด - เปิด เครื่อง (On-Off Switch)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spectrophotometer						
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่ (Battery Backup) >= 2.5 VDC		<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. หัววัดเลือกความยาวคลื่น (Wavelength Control)		<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	656.1 nm 656.1 nm
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 8,000 hour)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ชุดรับหลายตัวอย่าง (Carousel Module)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
pH Meter and Conductivity Meter						
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)		<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)		<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดป้องกัน Electrode (Dust Protection Hood)		<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)		<input type="checkbox"/>	<input type="checkbox"/>	
Turbidimeter						
<input type="checkbox"/>	<input type="checkbox"/>	16. หัววัดที่ไม่มีสาร (No Sample)		<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการอุดตันหัววัด (>= 2.5 ไมครอน 3.0)		<input type="checkbox"/>	<input type="checkbox"/>	
Automatic Dilutor						
<input type="checkbox"/>	<input type="checkbox"/>	18. หัวฉีด Piston Burettes		<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing		<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายนำและอุปกรณ์ประกอบ		<input type="checkbox"/>	<input type="checkbox"/>	

ผู้ตรวจสอบหน้า:

Mr. Chutaphon Fothong
Service Engineer

DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Thailand 10260
Phone: +66 255 7050 Email: info@dksh.com Website: www.dksh.com

Delivering Growth - In Asia and Beyond

CAL-FM-R31-05: 20 Jul 2022



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 2: EQUIPMENT CALIBRATION AND TESTING SERVICES
534-PATANA BURI RD. SOI 14, BANGKOK, 10260, THAILAND
TEL: 0-2717-9991 FAX: 0-2717-9991



Cert.No.: 23CH275
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenCompact S220
Serial No. : C104059460
ID No. : RYG_END183
Condition As-Received : Used Item
Received Date : 24 February 2023
Calibration Date : 27 February 2023
Reference : 2302-0886DSC-2
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5, T. Maenam Khru, A. Phakdaeng,
Rayong 21140, Thailand

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

Calibrated by : Waisak Sirinhean

Approved by :
Approved Signatory

() Malee Bulkruea
(✓) Sathip Meangmai
() Witsakorn Jerngagirekul

Issue Date : 28 February 2023
The Uncertainty is for a confidence probability of approximately 95%.

Manufactured, not independently verified, in accordance with ISO 9001:2015
Approved by Calibration and Testing Services (CALS) and Testing Services (TSS)

1149928



Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030048	130RC118	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4882054	110RC044	22I1306	27 Oct 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-1635

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	826588	09 July 2024
pH 6.867	CPA chem	826588	09 July 2023
pH 10.010	CPA chem	863935	28 Dec 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
		pH	mV	mV	pH		
pH Meter	4.000		177.48	177.4	4.000	0.058	2.00
S/N : C104059460	7.000		0.00	-0.1	7.000	0.058	2.00
	10.000		-177.48	-177.5	10.000	0.058	2.00

1149925



Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N : 1453404	4.008	4.008	179.1	0.0046	2.00
	6.867	6.868	4.7	0.0034	2.00
	10.010	10.013	-172.4	0.0069	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe

- Model : InLabExpert Pro-ISM
- Serial No. : 1453404
Dimension of probe:
- Length : 120 mm
- Diameter : 12 mm
- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.001	24.8	-0.201	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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1149924



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 2: EQUIPMENT CALIBRATION AND TESTING SERVICES
534-PATANA BURI RD. SOI 14, BANGKOK, 10260, THAILAND
TEL: 0-2717-9991 FAX: 0-2717-9991



Certificate of Calibration

Certificate No. : 23E750
Page : 1 of 2

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenCompact S220
Serial No. : C104059450
ID No. : RYG_END183
Condition As-Received : Used Item
Received Date : 14 February 2023
Calibration Date : 28 February 2023
Reference : 2302-0886DSC-2
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 10) %
616/10 Moo 5, T. Maenam Khru, A. Phakdaeng,
Rayong 21140, Thailand

Procedure used : Calibration was conducted using in-house calibration Procedure CP-E17 According to direct measurement method with Multi-Product Calibrator

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	0440007	22E1870	16 May 2023

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

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

4. This Certification is traceable to the International System of Unit maintained at:-

- National Institute of Metrology Thailand (NIMT)

Calibrated by : Wuttanaporn Wongpakdee Approved Signatory :
Issue Date : 02 March 2023
() Prithong Prabpai
(✓) Nontawat Khramchai
() Puntitong Tameyaku

0309672



Cert. No.: 23E753
Page: 2 of 2

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

Function: DC voltage measurement	Range: 2000 mV		
Standard Value	UUC* Reading	Error	Uncertainty
(mV)	(mV)	(mV)	(± μ V)
-200.0000	-200.0	0.0	72
-150.0000	-150.0	0.0	69
-100.0000	-100.0	0.0	65
-50.0000	-50.0	0.0	62
0.0000	0.0	0.0	56
50.0000	50.0	0.0	62
100.0000	99.9	-0.1	65
150.0000	149.9	-0.1	68
200.0000	199.9	-0.1	72

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

UUC* = Unit Under Calibration.

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B 1150477



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhro, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851, +668 8247 2360

Website : www.sci.co.th E-Mail : calibrate@sci.com



Certificate No. T230116

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room)

Manufacturer : MODULAR

Model : IREVCOHCOO

Serial No. : C00351459

Customer Code : RYG_EN0184

ID No. : T1939A5

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

616/10 Moo 5 T.Moenam Kho,
A.Pluakdaeng, Rayong 21140

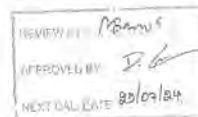
Customer Location : Laboratory

Date of Receipt : 23 January 2023

Calibrated By : Atiphong Rongrat (Technician)

Approved By : Bunjai / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 07 FEB 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.

TM-1 (4/8/51)00-62



Metrological Center
SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhro, Saraburi 18110, Thailand.



Certificate No. T230116

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)

Date of Calibration : 25 January 2023

Environment : Temperature : 23.4-24.9 °C
Line Voltage : 221.4-230.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 (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.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN141-TN150	T222123	5 October 2023
TC	TYPE T	TN151-TN160	T222123	5 October 2023
DATA LOGGER	34970A	T150	T222123	5 October 2023

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 1 Hour
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

Approved By: Bunjai

3301161715-00-63



Metrological Center

SCI ECO Services Company Limited

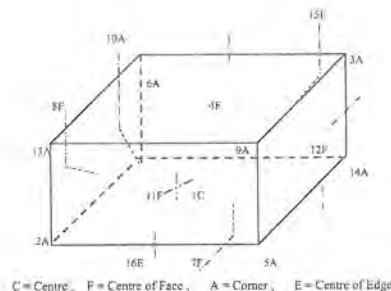
33/2 Moo 3, T.Banpa, A.Kaengkhro, Saraburi 18110, Thailand.



Certificate No. T230116

Page 3 of 4

Calibration Report



1C = TN141	12F = TN152
2A = TN142	13A = TN153
3A = TN143	14A = TN154
4F = TN144	15E = TN155
5A = TN145	16E = TN156
6A = TN146	
7F = TN147	
8F = TN148	
9A = TN149	
10A = TN150	
11F = TN151	

Approved By: Bunjai

TM-1 (4/8/51)00-62



Certificate No. T230116

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150	TN151	TN152
3.0	3.03	3.16	3.15	3.19	3.45	3.47	3.21	3.35	3.54	3.45	3.24	3.34
	TN153	TN154	TN155	TN156								
	3.28	3.22	3.28	3.21								

Chamber (Cooling Room)			Temperature Distribution			
Setting (°C)	Reading (°C)		Stability (°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max				
3.0	2.8	4.1	3.5	1.20	1.20	1.90

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]

FORM 1511E (150406)



Cert.No.: 22TW34
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Received Date : 11 February 2022
Test Date : 14 February 2022
Reference : 2202-0404DSC-4
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5 T.Maenam Khu. A.Pluakdaeng,
Rayong 21140, Thailand

REVIEW BY	<i>N. B. [Signature]</i>
APPROVED BY	<i>D. [Signature]</i>
NEXT CAL. DATE	15/8/23

Laboratory Condition : Temperature : (25 ± 5) °C
Humidity : (50 ± 20) %
Test Procedure : In-house method - CP-018
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sitrhean

Approved by :

[Signature]
Approved Signatory

() Ma'ee Butkrusa
(✓) Saitrip Meangmai
() Werakorn Lemgagrakul

Issue Date : 18 February 2022

8 02B1285



Cert.No.: 22TW34
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 15E100404

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
B O2	8.02	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full without written approval of the laboratory

-090-

Saitrip

8 1094744



Cert. No.: 22LM12
Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu. A.Pluakdaeng,
Rayong 21140, Thailand
Location : TPA On Site Calibration Laboratory

Received Order : 11 February 2022
Calibrated Date : 21 February 2022
Ambient Temperature : (25 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Kundill Prompai

Approved by :

[Signature]
Approved Signatory

() Ponthipha Temayakul
(✓) Ma'ee Butkrusa
() Suwit Imjai

Issue Date : 21 February 2022

The Uncertainties are for a confidence probability of approximately 95 %

This certificate is valid only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full without written approval of the laboratory

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Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2202-0404DSC-5

Cert. No.: 22LM12
Page: 2 of 2

Procedure Used :-
Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date
1) Digital Thermometer 1523 2168080 2111273 22 Nov 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement

This instrument was connected with temperature sensor, S/N: 15E100484

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	45	20.001	19.88	-0.121	0.15	2.00

UUC : Unit Under Calibration

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

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1095714



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
1. ORGANIZABLE SERVICE & EQUIPMENT CALIBRATION AND TESTING SERVICES
1442 PATTAYAKARN ROAD SUKHUMVIT 11, SUKHUMVIT 11, SUKHUMVIT 11, SUKHUMVIT 11, SUKHUMVIT 11
TEL : 0 2711 800 77 FAX : 0 2711 800 78



Certificate of Calibration

Cert. No.: 22TM317
Page: 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V618.0084

ID No. : RYG_END0154

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

Location : BOD Room

Received Order : 22 April 2022

Calibration Date : 22 April 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Prittanapongpaiboon

Approved by :
Approved Signatory

() Ponthipha Tameyakul
() Malee Bulkruea
() Suwit Imjai

Issue Date : 3 May 2022

The Uncertainties are for a confidence probability of approximately 95 %

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A 0040735



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1

Cert. No.: 22TM317
Page: 2 of 3

Procedure Used :-
Calibration were conducted using calibration procedure CP-OT02 according to direct measurement.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

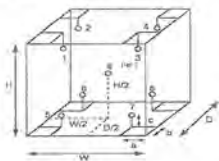
Instrument Model Serial No. Cert. No. Due Date
1) Data Acquisition 34870A MY44031788 21LM12 02 Sep 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 10 cm D = 0.80 m
b = 10 cm W = 1.0 m
c = 10 cm H = 1.2 m
Capacity = 0.75 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	58
AC Supply (Volt)	221	223

Position :	Ref. Std. ID No.
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

1106485



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM317
Page: 3 of 3

Calibration Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	20.0	20.0	0.022	0.20	0.22	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.209	20.174	20.198	20.110	20.075	20.062	20.027	20.089	20.030

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration

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

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

-000-

1106484



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
1344 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2713-3000 FAX 0-2713-9439



Certificate of Calibration

Certificate No.: 22T1501
Page: 1 of 2

Cert. No.: 22T1501
Page: 2 of 2

Equipment: Digital Thermometer With Sensor
Manufacturer: Testo
Model: 106
Serial No.: 51262167/504
ID No.: RYG_F50468
Condition As-Received: Used Item
Received Date: 01 September 2022
Calibration Date: 07 September 2022
Reference: 2208-0057DSC
Ambient Temperature: $(25 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 20) \%$
Submitted by: A/S Laboratory Group (Thailand) Co., Ltd. Rayong Branch
11610 Moo 5 T. Maenam Kh. A. Pliakong, Rayong
21140 Thailand

Procedure used: Calibration were conducted using in-house comparison procedure (CP-10) according to comparison with Industrial Platinum Resistance Thermometer (IPRT) and IPRT bath temperature controller.
The temperature scale used was based on ITS-90

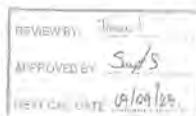
Condition of this result of calibration

1. Reference Standards (Instrument)

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Stack Stack Thermometer	1500	80454	22818	23 May 2023
2) IPRT Scanner Module	2582	A01303	22818	23 May 2023
3) Industrial Platinum Resistance Thermometer	5827-12	571871	22818	23 May 2023

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

3. The Calibration is traceable to the International System of Unit maintained at:
National Institute of Metrology Thailand (NIMT)



Calibrated by: Satorpon Muangmoo
Issue Date: 15 September 2022

Approved Signatory:
() Phaisorn Phaisorn
() Chutima Chutima
() Walee Lamsan

0296764



Result of Calibration:

Without Adjustment

Function: Temperature measurement

Dimension of probe: Diameter 3 mm, Length 55 mm, Sheath material: Stainless Steel

Immersion Depth (mm)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of Measurement ($\pm ^{\circ}\text{C}$)
50	25.0049	24.9	-0.1049	0.12
50	30.0039	29.9	-0.1039	0.12
50	39.9959	39.9	-0.0999	0.12

UUC*: Unit Under Calibration

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

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1125043



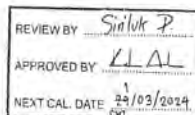
TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
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TEL. 0-2713-3000 FAX 0-2713-9439



Cert. No.: 22CG3154
Page: 1 of 2

Certificate of Calibration

Equipment: Burette
Capacity: 50 mL
Serial No.:
ID. No.: BKK_EN0171
Manufacturer: Witeg
Made in: Germany
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.
Khwaeng Phatthanakan, Khel Suan Luang
Bangkok 10250 Thailand
Ambient Temperature: $(20 \pm 2.5) ^\circ\text{C}$
Relative Humidity: $(50 \pm 10) \%$
Barometric Pressure: 759 mmHg
Calibration Procedure: ASTM E 542 - 01
Calibrated by: Panward Pramkham



Approved by:
() Pornthippa Tameyakul
() Malee Bulkruea
() Ponpan Paipim
() Srisuda 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: 26 August 2022
Condition As-Received: Used Item
Calibration Date: 30 August 2022
Reference: 2208-0918DSC-2

Cert. No.: 22CG3154
Page: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments:

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	AE200S	N03679	140RC001	21MM429	NIMT	22 Sep 2022
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	22H1243	NIST, NIMT	09 June 2023
3) Thermometer		1594592	140EC010	221181	NIMT	10 Feb 2023

This certificate is traceable to the SI Unit.

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

3. True value is converted to true volume at the standard temperature of $20 ^\circ\text{C}$

Calibration result:

Nominal capacity (mL)	Reading (mL)	Uncertainty (\pm 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-

1123908



SARTORIUS

REVIEW BY: Sirint P.
APPROVED BY: LI AL
NEXT CAL. DATE: 8/1/24

Certificate of Calibration

Model Number: MSE224S-100-DU
Description: Analytical Balance
Serial Number: 26207042
ID No.: BKK_EN0002
Manufacturer: Sartorius
Certificate No.: 23BC10072
Issued Date: Monday, February 13, 2023
Reference No.: 203245
Page No.: 1 of 2

Customer Name: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250.

Calibrated Place: Balance Room

Calibrated By: Mr. Chonchai Inthana
Calibration Date: Wednesday, February 08, 2023

Metrological data:
Capacity: 220 g Readability: 0.0001 g
Reasons for calibration:
☐ New Installation ☐ Service / Repair ☒ Re-Calibration / Maintenance
Ambient Conditions:
Temperature: 23.2 °C ± 5.0 °C
Humidity: 60.0 % RH ± 10.0 % RH
Pressure: ±
Equipment Condition: ☒ Good ☐ Fair

Measurement Method UKAS Publication Ref: Lab 14
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 calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2 YCS011-522-00	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Balometer/Temp. Lubon MHB-382SD	DKSH	C19220444	5-Sep-2023

This certificate relates and apply this equipment only.
This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division.
Sartorius (Thailand) Co., Ltd.

SOP FM 33_03 February 2022

Mr. Chonchai Inthana (Technical Manager)



SARTORIUS

Certificate of Calibration

Model Number: MSE224S-100-DU
Description: Analytical Balance
Serial Number: 26207042
ID No.: BKK_EN0002
Manufacturer: Sartorius
Certificate No.: 23BC10072
Issued Date: Monday, February 13, 2023
Reference No.: 203245
Page No.: 2 of 2

Calibration Results : Without Adjustment

Repeatability		Eccentricity (Off-center loading error)	
The repeatability is the ability of a weighing instrument to display nearly identical readings under constant load conditions when the same load with a measurement error is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.		The off-center loading error is yielded by the difference between the reading of the load, i.e. 1/2 or 3/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R110).	
Nominal Value (Low Load)	20.0000 g	Nominal value	50 g
20 g	20.0000 g	Tolerance	0.0004 g
Tolerance	0.0001 g		
Nominal Value (High Load)	200 g		
200 g	200.0000 g		
Tolerance	0.0001 g		
Standard Deviation	0.00004		

Linearity

The linearity, also called inaccuracy, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

The repeatability of the mass measurement is 0.0002 g				
Tolerance 0.0002 g				
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00014
0.1	0.1000	0.1000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
2	2.0000	2.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00014
50	50.0000	50.0000	0.0000	0.00014
100	100.0000	100.0000	0.0000	0.00014
200	200.0000	199.9999	-0.0001	0.00030

End of Report

SOP FM 33_03 February 2022



Certificate No. T222502

Page 1 of 4

Certificate of Calibration

Equipment: Chamber (Oven)
Manufacturer: Memmert
Model: UF 450
Serial No.: B7170531
Customer Code: BKK_EN0273
ID No.: T8042A4
Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250
Customer Location: Oven Room
Date of Receipt: 23 November 2022
Calibrated By: Sujjar Nakkakred (Site Calibration Manager)
Approved By: Boonchai Suriyawong (Site Calibration Manager)
Date of Issue: 09 DEC 2022

REVIEW BY: Sirint P.
APPROVED BY: LI AL
NEXT CAL. DATE: 29/05/24

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.

FM-L1410/01/08-64



Certificate No. T222502

Page 2 of 4

Calibration Report

Equipment: Chamber (Oven)
Date of Calibration: 29 November 2022
Environment: Temperature: 29.1-29.6 °C
Line Voltage: 221.3-223.2 V
Relative Humidity: 55-65 %RH

Condition of this results of calibration:

1. This equipment was calibrated by insert nine resistance thermometer detectors and nine standard thermocouples type T into its chamber, the other one resistance thermometer detector use for ambient temperature measurement.
The calibration was done in accordance to WI-T20 (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.

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	27-(CH1-ID)	T210094	30 December 2022
TC	TYPE T	TN261-TN270	T210010	30 December 2022
DATA LOGGER	34970A	T149	T210004	30 December 2022

3. This certificate is traceable to:
National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244).

4. Condition of calibrated item: good

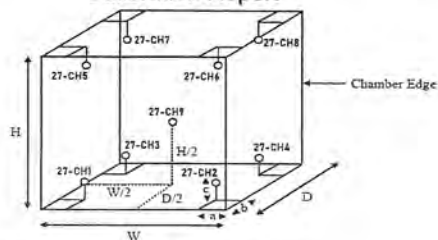
Equipment Description:
Time Constant: 1 Hour 49 Minute At 104 °C
Fresh Air Damper: ☒ Open ☐ Min ☐ Medium ☒ Max
☐ Close
☐ Not Available

5. Adjustment:
() without adjustment (X) after adjustment

Approved By: Boonchai Suriyawong

FM-L1511/15-05-63

Calibration Report



Remark :

Internal Dimensions of Chamber : W (Width) = 104 cm, H (Height) = 72 cm, and D (Depth) = 60 cm.
Size of Installed Standard (size number 27-CH1) to number 27-CH9 : a = 5 cm, b = 5 cm, and c = 5 cm.
Size of Installed Standard (size number 27-CH9) : W/2 = 104 cm/2, H/2 = 72 cm/2, and D/2 = 60 cm/2

Measurement Results

Average Standard Reading at each position (°C)								
Calibration Point	27-CH1	27-CH2	27-CH3	27-CH4	27-CH5	27-CH6	27-CH7	27-CH8
104	104.07	103.65	103.45	104.02	104.47	103.57	104.59	103.78

Chamber (Oven)		Temperature Distribution					
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max					
104.0	-	-	104.0	0.07	0.70	0.42	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

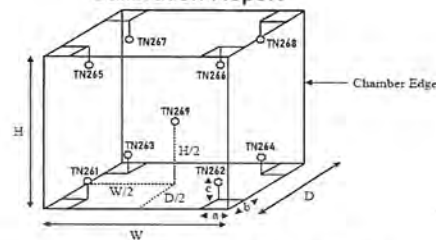
The result of test was found accurate as shown on date and place of test only.

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:

FM-L15 (17/15-05-03)

Calibration Report



Remark :

Internal Dimensions of Chamber : W (Width) = 104 cm, H (Height) = 72 cm, and D (Depth) = 60 cm.
Size of Installed Standard (size number TN261) to number TN268 : a = 5 cm, b = 5 cm, and c = 5 cm.
Size of Installed Standard (size number TN269) : W/2 = 104 cm/2, H/2 = 72 cm/2, and D/2 = 60 cm/2

Measurement Results

Average Standard Reading at each position (°C)								
Calibration Point	TN261	TN262	TN263	TN264	TN265	TN266	TN267	TN268
180	179.14	179.17	179.65	179.26	180.41	179.64	181.18	180.99

Chamber (Oven)		Temperature Distribution					
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max					
180.0	-	-	180.0	0.38	1.78	1.10	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:

FM-L15 (17/15-05-03)

Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-307/22
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11454908533CD
ID No. BKK_EN0018
Date of receipt 16 September 2022
Date of calibration 16 September 2022
Date of issue 23 September 2022

Customer name ALS Laboratory Group (Thailand) Co., Ltd.
Address 104 Soi Phatthanakan 40, Phatthanakan Road, Phatthanakan, Suan Luang, Bangkok 10250

Temperature (22.1-23.3) °C (On site)
Humidity (58.8-63.2) %RH (On site)

Equipment condition Good Operation

Calibration Location Organic Prep

Calibration Procedure In-house method UV-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 95917 and 95918
Photometric Accuracy is traceable to certificate No. 95924 and 95937
Stray Light is traceable to certificate No. 95908
The above certificates are traceable to SI unit through Sigma Scientific Ltd (UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr. Wanich Jangthung

REVIEW BY
APPROVED BY
NEXT CAL DATE 16/9/23

Approved by:

Mr. Kanchit Choothep
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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except in full, without written approval of the Bara Scientific Co., Ltd.

Certificate of Calibration

Certificate No. BSCC-UV-307/22

Number of Page(s) 2 of 3

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
241.70	241.65	-0.05	0.18
334.02	333.92	-0.10	0.18
418.53	418.46	-0.07	0.18
572.99	572.96	-0.03	0.18
579.41	579.17	-0.24	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.2487	0.2481	-0.0006	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8662	0.8647	-0.0015	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2904	0.2911	0.0007	0.0075
350	0.0000	0.0000	0.0000	0.0075
	0.8428	0.8426	-0.0003	0.0075

*CNR = Customer not request

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Bara Scientific Co., Ltd.
968 U Chu Leng Building Floor 7 Rama4 Road
Siom Bangkok Bangkok Thailand 10100
Tel : 02-6324300 Fax : 02-6375496-7
www.barscientific.com



Certificate of Calibration

Certificate No. BSCC-UV-30722

Number of Page(s)

3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0090	0.0000	0.0090	0.0042
	0.5783	0.5777	-0.0006	0.0042
	0.7828	0.7835	0.0007	0.0046
	1.0208	1.0230	0.0024	0.0042
440.0	0.0090	0.0000	0.0090	0.0042
	0.5521	0.5618	-0.0093	0.0042
	0.7455	0.7460	-0.0005	0.0045
	0.9185	1.0005	-0.0820	0.0042
465.0	0.0090	0.0000	0.0090	0.0042
	0.5227	0.5219	-0.0008	0.0042
	0.6860	0.6884	-0.0024	0.0051
	0.8487	0.9503	-0.1016	0.0042
546.1	0.0090	0.0000	0.0090	0.0042
	0.5207	0.5199	-0.0008	0.0042
	0.6873	0.6871	-0.0002	0.0049
	0.9958	0.9964	-0.0006	0.0042
590.0	0.0090	0.0000	0.0090	0.0042
	0.5544	0.5534	-0.0010	0.0042
	0.7253	0.7242	-0.0011	0.0050
	1.0942	1.0943	-0.0001	0.0042
635.0	0.0090	0.0000	0.0090	0.0042
	0.5616	0.5606	-0.0010	0.0042
	0.6927	0.6921	-0.0006	0.0053
	1.0881	1.0885	-0.0004	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC) Wavelength (nm)	Transmission (%)	Absorbance (A)
200.86±0.11nm	200.30	0.9505	2.0229

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

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

End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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FM-UV-T08-02 Rev 01 (2301103)



Agilent CrossLab Compliance

Qualification Type: ICPMS-QQ

System ID: JP12091612

EQP Name: Agilent Recommended

EQP Revision: ICPMS 02 50

EQP Publish Date: March 2020

Date: June 14, 2022 10:32:16 AM

Report Type: Report

Org. Name: ALS Laboratory Group (Thailand) Co., Ltd.

Org. Location: 104 Phothanankorn 40, Suan Luang, Bangkok 10250 Thailand.

REVIEW BY: T. H. B. S. C.
APPROVED BY: S. H. S. C.
NEXT CAL. DATE: 14.11.23

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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Integrated Sample Introduction System (ISIS) Check : ISIS2	9
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Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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Test Summary

Purpose

This section includes a status for each scheduled test and the overall qualification. For each test that is run, (1) the status is automatically determined based on pre-defined limits, and (2) the total number of times the test was run is displayed. For detailed results and specifications for a test, refer to the test results in this EQR.

Details	Status	Runs
Test		
Autosampler Check : ASX-520	Pass	1
Integrated Sample Introduction System (ISIS) Check : ISIS2	Pass	1
Autotune : G3281A	Pass	1
Background (No Gas Mode) : G3281A	Pass	1
Background (Gas Modes) : G3281A	Pass	1
20-Minute Stability (No Gas Mode) : G3281A	Pass	1
Overall Qualification Status	Pass	

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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Service Details

Purpose

This section includes local contact and delivery details for this service.

General Details

Service Order No./Request: 6025218484
EQP Name: AgilentRecommended
EQP Revision: ICPMS.02.50
Report Type: Report

Organization Details

Name: ALS Laboratory Group (Thailand) Co., Ltd.
Location: 104 Phatthanakarn 40, Suan Luang, Bangkok 10250 Thailand

Local Contact Details

Name: Khin Charoanai
Job Title: Lab Manager
Qualification Location: Spectro Room

Operator Details

Name: Panchap Kuratrain
Job Title: Field Service Engineer

Data Acquisition Details

Acquisition Software Name: MassHunter
Acquisition Software Revision: G.01.01

Customer Data System (CDS)

icpms: MassHunter

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

ICP-MS 1

Manufacturer: Agilent Technologies
Name: 7700x
Model Number: G3281A
Detector Type: SQ
Nebulizer: Mira Mist (G3161)
Spray Chamber: Quartz
Torch: Quartz
Sampling Cone: Ni
Skimmer Cone: Ni
Serial Number: JP12091612
Firmware Revision: D.01.01

ISIS 1

Manufacturer: Agilent Technologies
Name: ISIS2
Model Number: G4911A
Installed Options: #002: 2 pumps, 1 valve, auto dilution and discrete sampling
Type: Peristaltic pump system

Autosampler 1

Manufacturer: Agilent Technologies
Name: ASX-520
Model Number: G3286A
Serial Number: G31403A520

Chiller 1

Manufacturer: Agilent Technologies
Name: Chiller
Model Number: G3292A
Serial Number: 4N1223700

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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Calculation Formulas

Purpose

This section includes calculation formulas for all available tests. Depending upon which tests are scheduled, all or some apply to your qualification.

For a description of calculations for ICP-MS tests performed by the MassHunter software, refer to the MassHunter application and documentation.

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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Protocol Details

Purpose

This section lists the revisions for all test units used in this report. For complete test-specific and high-level change details, refer to the Revision History document.

Test Revision	Test
ICPMS.02.50	20-Minute Stability (No Gas Mode)
ICPMS.02.50	Autosampler Check
ICPMS.02.50	Autotune
ICPMS.02.50	Background (Gas Modes)
ICPMS.02.50	Background (No Gas Mode)
ICPMS.02.50	Integrated Sample Introduction System (ISIS) Check

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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Autosampler Check

Purpose

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

Setpoint

Results	Criteria	Observed Result	Expected Result	Status
After the self test, is probe in the home position?	Yes	Yes	Yes	Pass
As commanded, is the probe positioned at vial 2?	Yes	Yes	Yes	Pass

Setpoint Status: Pass

Run: 1

Overall Autosampler Check Test Status

Pass

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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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

Results	Criteria	Observed Result	Expected Result	Status
As commanded, does the pump prime?	Yes	Yes	Yes	Pass
As commanded, do the valves load and inject?	Yes	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: JP12091612

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Autotune

Purpose

This test uses traceable checkout 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

Results

Peakwidth Mass 7	0.735	AMU
Agilent Recommended:	>= 0.65 <= 0.80	
Status:	Pass	
Peakwidth Mass 89	0.732	AMU
Agilent Recommended:	>= 0.65 <= 0.80	
Status:	Pass	
Peakwidth Mass 205	0.746	AMU
Agilent Recommended:	>= 0.65 <= 0.80	
Status:	Pass	
Mass Axis 7	7.00	AMU
Agilent Recommended:	>= 6.9 <= 7.1	
Status:	Pass	
Mass Axis 89	89.00	AMU
Agilent Recommended:	>= 88.9 <= 89.1	
Status:	Pass	
Mass Axis 205	205.00	AMU
Agilent Recommended:	>= 204.9 <= 205.1	
Status:	Pass	

Date: June 14, 2022 10:32:16 AM
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Mass 7 Sensitivity No Gas	51.18	Mcps/ppm
Agilent Recommended:	>= 25.5	
Status:	Pass	
Mass 89 Sensitivity No Gas	247.81	Mcps/ppm
Agilent Recommended:	>= 85	
Status:	Pass	
Mass 205 Sensitivity No Gas	154.87	Mcps/ppm
Agilent Recommended:	>= 51	
Status:	Pass	
Mass 59 Sensitivity He	84.86	Mcps/ppm
Agilent Recommended:	>= 20.4	
Status:	Pass	
Oxide Ratio 159/140	1.116	%
Agilent Recommended:	<= 1.26	
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

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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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

Conditions

Masses: 7 AMU
89 AMU
205 AMU

Measurements and Results

Masses (AMU): 7 89 205
Measured Value: 4.900 7.100 15.400 cps
Agilent Recommended: <= 10 <= 10 <= 30
Status: Pass Pass Pass

Setpoint Status: Pass

Runs: 3

Overall Background (No Gas Mode) Test Status

Pass

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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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

Conditions

Gas Mode: Helium
Mass: 78 AMU
Integration Time: 1.0 sec
Cycles: 20

Measurements and Results

Mass (AMU): 78
Measured Value: 21.1000 cps
Agilent Recommended: <= 400
Status: Pass

Setpoint Status: Pass

Runs: 11

Overall Background (Gas Mode) Test Status

Pass

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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20-Minute Stability (No Gas Mode)

Purpose

This test monitors the abundance of ions present in the checkout 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

Conditions

Mode: Spectrum
Masses: 7, 9, 59, 89, 140, 205
Integration Time: 5.99 sec
Peak Pattern: 3 pycnst/peak
Repetitions: 20
Sweeps/Replicates: 100

Measurements and Results

Masses (AMU): 7 89 205
Stability RSD: 0.0% 0.6 0.6 %
Agilent Recommended: <= 3.45 <= 3.45 <= 3.45
Status: Pass Pass Pass

Setpoint Status: Pass

Runs: 1

Overall 20-Minute Stability (No Gas Mode) Test Status

Pass

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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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 evergreen 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.

Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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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, GUP, ALCOA, etc.), instrument hardware and software components, and the ACE technique itself. This 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	Turn reports	21
EQR	General	Test Report	24
EQR	General	Test Report	26

Date: June 14, 2022 10:32:15 AM
System ID: JP12091512

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General

Document Name: Certificate of System Qualification


Agilent Technologies

Agilent Compliance Engine Self Qualification

Date: September 14, 2021 4:59:15 PM
Device Serial #: JCA02508 Platform Revision: ACE 3.11

Individual self-qualification reports for each specific technique installed are also available upon request. They provide additional details on the general report from the massive summary and are directed by the actual algorithmic modeling during the process. There is not a one-to-one relationship between algorithms and QO program tests because some algorithms are used by several tests and some multiple similar hardware components of the qualified systems.

Technique Type	Tests Completed	Result
Alarm: Alarm	7	Conforms
Capacity (Elution)	10	Conforms
Discipline	6	Conforms
Emission Spectroscopy	3	Conforms
Gas Chromatography - GCMS	17	Conforms
Gas Chromatography	29	Conforms
Gas Permeation Chromatography	3	Conforms
GC-MS	9	Conforms
Infrared Spectroscopy	7	Conforms
Liquid Chromatography	17	Conforms
Liquid Chromatography - LCMS	4	Conforms
Mass filters	18	Conforms
Sample Preparation - Gas Chromatography	8	Conforms
Sample Preparation - Liquid Chromatography	8	Conforms
Supercritical Fluid Chromatography	15	Conforms
Sensors	8	Conforms
UV-Vis Spectrophotometer	13	Conforms

Overall Qualification Status:
Conforms

Date: June 14, 2022 10:32:15 AM
System ID: JP12091512

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General

Document Name: Operator's training certificate and qualifications


Agilent Technologies

Certificate of Completion

Learner Name: Parthiv Kurnikar
Title Of Course: AN-CE-ICPMS-2-617-1700u/TW0u ICP-MS Insp. - Oper 3/16 SW & QO 7/17
Completion Date: November 22, 2021
Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations:

A certificate for Service and Support training is only valid when employed by Agilent Technologies or while working in an Agilent authorized service provider, through which the service engineer has acquired access to Agilent's Safety Alerts, Service News, internal technical updates, repair training, system documentation, technical support, custom parts, and spare spares. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Date: June 14, 2022 10:32:15 AM
System ID: JP12091512

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General

Document Name: Certificate of Qualification for ACE


Agilent Technologies

Certificate of Completion

Learner Name: Parthiv Kurnikar
Title Of Course: AN-CE-S5-II-450-A: ACE 3.X User Update Training
Completion Date: July 7, 2020
Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific limitations:

A certificate for Service and Support training is only valid when employed by Agilent Technologies or while working in an Agilent authorized service provider, through which the service engineer has acquired access to Agilent's Safety Alerts, Service News, internal technical updates, repair training, system documentation, technical support, custom parts, and spare spares. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Date: June 14, 2022 10:32:15 AM
System ID: JP12091512

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General

Document Name: Test Report

Batch Summary Report

Batch Number: D:\Agilent Services\PMCO (15-6) 0280 (No.1)
Analysis File: 80 No batch bin
Time Step: P1 No

Run	Acq. Date/Time	Batch File	Sample Name	Time	Unit	Division
1	6/14/2022 10:03:38 AM	800204P1.c	80-11g	1.1 minute		1.0000

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6/14/2022 10:03:04 AM

Date: June 14, 2022 10:32:18 AM
System ID: JP12031612

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Document Name: Test Report

Batch Summary Report

Analysis

Sample Name	CPK	CPK STD
1 80-11g	0.11000	0.01

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6/14/2022 10:03:04 AM

Date: June 14, 2022 10:32:16 AM
System ID: JP12051612

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General

Document Name: Test Report

Batch Summary Report

Batch Number: D:\Agilent Services\PMCO (15-6) 0280 (No.1)
Analysis File: 80 No batch bin
Time Step: P1 No

Run	Acq. Date/Time	Batch File	Sample Name	Time	Unit	Division
1	6/14/2022 9:53:27 AM	800204P1.c	80-11g	1.1 minute	Sample	1.0000

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6/14/2022 9:53:59 AM

Date: June 14, 2022 10:32:16 AM
System ID: JP12051612

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Document Name: Test Report

Batch Summary Report

Analysis

Sample Name	CPK	CPK STD	CPK	CPK STD	CPK	CPK STD	CPK	CPK STD
1 80-11g	0.11000	0.01	0.11000	0.01	0.11000	0.01	0.11000	0.01

Sample Name	CPK	CPK STD	CPK	CPK STD
1 80-11g	0.11000	0.01	0.11000	0.01

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6/14/2022 9:53:59 AM

Date: June 14, 2022 10:32:16 AM
System ID: JP12051612

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Purpose

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Details

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

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Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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User Name: panthep_kurasaithin Username: ASB5000312				System ID: JP12091612 Print Date: June 14, 2022 10:32:16 AM
ALS OQHW 7706 14Jun2022 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 14, 2022 10:14:43 AM	Auto	Session Created	Session	None
June 14, 2022 10:14:43 AM	Start	Configuration	Session	None
June 14, 2022 10:14:43 AM	Auto	Execution	Execution	User is Field Engineer and shall not require an access code
June 14, 2022 10:19:18 AM	Auto	EQP Update	Session	EQP data is for primary instrument (cpms) - Flagged (PreviousPurgedcpmsCardg version02.50cpms02.50.4.43) EQP File Name: (cpms02.50.4.43).EQP Update (AgilentRecommended)
June 14, 2022 10:19:23 AM	End	Configuration	Session	None
June 14, 2022 10:19:24 AM	Start	Configuration	Session	EQ
June 14, 2022 10:19:24 AM	Start	Execution	Autosampler Check (ASX-500)	None
June 14, 2022 10:19:42 AM	End	Execution	Autosampler Check (ASX-500)	Run Count: 1
June 14, 2022 10:19:43 AM	Start	Execution	Integrated Sample Introduction System (ISIS) Check (ISIS)	None
June 14, 2022 10:19:47 AM	End	Execution	Integrated Sample Introduction System (ISIS) Check (ISIS)	Run Count: 1
June 14, 2022 10:19:56 AM	Start	Execution	Autotune (G2201A Autotune 1)	None
June 14, 2022 10:22:22 AM	End	Execution	Autotune (G2201A Autotune 1)	Run Count: 1

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Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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User Name: panthep_kurasaithin Username: ASB5000312				System ID: JP12091612 Print Date: June 14, 2022 10:32:16 AM
ALS OQHW 7708 14Jun2022 Transaction log:				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 14, 2022 10:23:38 AM	Start	Execution	Background (No Gas Mode) G2201A No Gas Mode Background 1	None
June 14, 2022 10:22:48 AM	End	Execution	Background (No Gas Mode) G2201A No Gas Mode Background 1	Run Count: 1
June 14, 2022 10:22:48 AM	Start	Execution	Background (Gas Mode) G2201A Gas Mode Background 1	None
June 14, 2022 10:23:35 AM	End	Execution	Background (Gas Mode) G2201A Gas Mode Background 1	Run Count: 1
June 14, 2022 10:23:37 AM	Start	Execution	20-Aminute Stability (No Gas Mode) G2201A 20-Aminute Stability (No Gas Mode) 1	None
June 14, 2022 10:24:06 AM	End	Execution	20-Aminute Stability (No Gas Mode) G2201A 20-Aminute Stability (No Gas Mode) 1	Run Count: 1
June 14, 2022 10:24:08 AM	End	Configuration	Session	EQ
June 14, 2022 10:24:08 AM	Start	Reporting	Session	None
June 14, 2022 10:32:26 AM	Auto	Reporting	Session	Report Generated: Certificate
June 14, 2022 10:32:26 AM	Auto	Reporting	Session	Report Generated: Report

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Date: June 14, 2022 10:32:16 AM
System ID: JP12091612

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Certificate of System Qualification

ICPMS-QO

System ID: JP12091612
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Phatthanakarn 40, Suan Luang, Bangkok 10250 Thailand

Date: June 14, 2022 10:32:51 AM
EQP Name: Agilent/Recommended
EQP Revision: ICPMS.02.50
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

Peakwidth Mass 7: Pass
Peakwidth Mass 89: Pass
Peakwidth Mass 205: Pass
Mass Axis 7: Pass
Mass Axis 89: Pass
Mass Axis 205: Pass
Mass 7 Sensitivity No Gas: Pass
Mass 89 Sensitivity No Gas: Pass
Mass 205 Sensitivity No Gas: Pass
Mass 59 Sensitivity He: Pass
Oxide Ratio 156/140: Pass
Doubly Charged Species Ratio 70/140: Pass

Overall Autotune Test Status:

Pass

Date: June 14, 2022 10:32:51 AM
System ID: JP12091612

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Background (No Gas Mode)

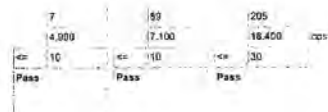
Setpoint Status: Pass

Masses (AMU):

Measured Value:

Agilent Recommended:

Status:



Overall Background (No Gas Mode) Test Status

Pass

Background (Gas Mode)

Gas Mode: Helium

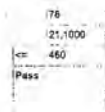
Setpoint Status: Pass

Mass (AMU):

Measured Value:

Agilent Recommended:

Status:



Overall Background (Gas Mode) Test Status

Pass

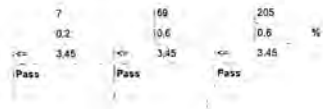
20-Minute Stability (No Gas Mode)

Masses (AMU):

Stability RSD:

Agilent Recommended:

Status:



Overall 20-Minute Stability (No Gas Mode) Test Status

Pass

Date: June 14, 2022 10:32:51 AM
System ID: JP12091812

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Instrument Details

Purpose:

This section describes the as found system configuration.

Details:

ICP-MS 1

Manufacturer: Agilent Technologies
Name: 7700x
Model Number: G3281A
Detector Type: SQ
Nebulizer: Mira Mist (G3161)
Spray Chamber: Quartz
Torch: Quartz
Sampling Cone: Ni
Skimmer Cone: Ni
Serial Number: JP12091812
Firmware Revision: D.01.01

ISIS 1

Manufacturer: Agilent Technologies
Name: ISIS2
Model Number: G4911A
Installed Options: 8003: 2 pumps, 1 valve, auto dilution and discrete sampling
Type: Peristaltic pump system

Autosampler 1

Manufacturer: Agilent Technologies
Name: ASX-520
Model Number: G3285A
Serial Number: G31403A620

Chiller 1

Manufacturer: Agilent Technologies
Name: Chiller
Model Number: G3292A
Serial Number: 4N1220700

Date: June 14, 2022 10:32:51 AM
System ID: JP12091812

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Electronic Signature

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Logged On User Name: panthep_kuresathain@agilent.com
Signature Creation Date: June 14, 2022
Reason for Signature: Executed protocol and published this original version of document.

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Date: June 14, 2022 10:32:51 AM
System ID: JP12091812

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User Name: user@agilent.com
Accession: ASB00000012System ID: JP12091812
Print Date: June 14, 2022 10:32:51 AM

ALS DOWN 1703 14Jun2022 Transaction log:

Date	Transaction State	Activity Performed	Type of Transaction	Optional Information
June 14, 2022 11:14:43 AM	Auto	Session Created	Session	None
June 14, 2022 11:14:43 AM	Start	Configuration	Session	None
June 14, 2022 11:14:43 AM	Auto	Execution	Licensing	User is first engineer and does not require an unlock code
June 14, 2022 11:18:18 AM	Auto	Engineered	Session	ICP details for primary nebulizer (ICPMS) - File path: (Protocol)Nebulizer/Cooling valve/MS2.000/MS2.000.001, ICP File Name: (ICPMS_00.00.00) ICP Name: (AgilentRecommended)
June 14, 2022 12:19:20 AM	End	Configuration	Session	None
June 14, 2022 12:19:20 AM	Stop	Configuration	Session	OK
June 14, 2022 12:19:20 AM	Stop	Validation	Autosampler Check: ASX-520: Name: Autosampler Check	
June 14, 2022 12:19:40 AM	End	Execution	Autosampler Check: ASX-520: Run Count: 1	
June 14, 2022 12:19:40 AM	Stop	Execution	Integrated Sample Introduction System (ISIS) Check: ISIS: Integrated Sample Introduction System (ISIS) Check	None
June 14, 2022 12:19:47 AM	End	Execution	Integrated Sample Introduction System (ISIS) Check: ISIS: Integrated Sample Introduction System (ISIS) Check	Run Count: 1
June 14, 2022 12:19:50 AM	Start	Execution	Autosampler: G3281A: Autosampler 1: Name	
June 14, 2022 12:20:22 AM	End	Execution	Autosampler: G3281A: Autosampler 1: Run Count: 1	

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Date: June 14, 2022 10:32:51 AM
System ID: JP12091812

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User Name: panthar_surasetthan
 Machine: AS8000K313
 System ID: JP1201612
 Print Date: June 14, 2022 10:32:51 AM

ALS CQHW 7700 14Jun2022 Transaction log:

Time	Transaction Date	Activity Performed	Type of Transaction	Optional Information
June 14, 2022 10:22:24 AM	Start	Evacuate	Background (No Gas Mode) G2011A: No Gas Mode Background 1	None
June 14, 2022 10:22:42 AM	End	Evacuate	Background (No Gas Mode) G2011A: No Gas Mode Background 1	Run Count: 1
June 14, 2022 10:22:45 AM	Start	Evacuate	Background (Gas Mode) G2011A: Gas Mode Background 1	None
June 14, 2022 10:23:05 AM	End	Evacuate	Background (Gas Mode) G2011A: Gas Mode Background 1	Run Count: 1
June 14, 2022 10:23:27 AM	Start	Evacuate	20-Minute Stability (No Gas Mode) G2011A: 20-Minute Stability (No Gas Mode) Stability 1	None
June 14, 2022 10:24:08 AM	End	Evacuate	20-Minute Stability (No Gas Mode) G2011A: 20-Minute Stability (No Gas Mode) Stability 1	Run Count: 1
June 14, 2022 10:24:08 AM	End	Qualification	Session	OK
June 14, 2022 10:24:08 AM	Start	Reporting	Session	None
June 14, 2022 10:30:26 AM	Audit	Reporting	Session	Report Generated: Certificate
June 14, 2022 10:30:38 AM	Audit	Reporting	Session	Report Generated: Report

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Date: June 14, 2022 10:32:51 AM
 System ID: JP1201612

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User Name: panthar_surasetthan
 Machine: AS8000K313
 System ID: JP1201612
 Print Date: June 14, 2022 10:32:52 AM

ALS CQHW 7700 14Jun2022 Transaction log:

Time	Transaction Date	Activity Performed	Type of Transaction	Optional Information
June 14, 2022 10:32:26 AM	Audit	Reporting	Session	Report Signed: Report PDF Name: ALS CQHW 7700 14Jun2022_20220614_OC Report.pdf User Name: panthar_surasetthan@agilent.com Full Name of Signer: Panthar Surasetthan Reason for Signature: Escorted printout and published this original version of document

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Date: June 14, 2022 10:32:51 AM
 System ID: JP1201612

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Metrological Center

SCI/ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

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

Certificate No. T220730

Page 1 of 6

Certificate of Calibration

Equipment : HEATING BLOCK
 Manufacturer : Environmental Express
 Model : SC 196
 Serial No. : 6974CECW3285
 Customer Code : BKK_EI.0054
 ID No. : T5306A3
 Customer : ALS Laboratory Group (Thailand) Co., Ltd.
 104 Phatthanasukan 40, Phatthanasukan Rd., Khwaeng Phatthanasukan,
 Khet Suan Luang, Bangkok 10250
 Customer Location : Acid Digestion Lab
 Date of Receipt : 30 March 2022
 Calibrated By : Watcharapon Sangtong (Technician)
 Approved By : [Signature] / Sujjar Nakhakred (Site Calibration Manager)
 Date of Issue : 12 APR 2022

REVIEW BY: [Signature]
 APPROVED BY: [Signature]
 NEXT CAL DATE: 7/20/24

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

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SM-112-009 May 21



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Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

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

Certificate No. T220730

Page 2 of 6

Calibration Report

Equipment : HEATING BLOCK
 Date of Calibration : 7 April 2022
 Environment : Temperature : 21.8-23.1 °C
 Line Voltage : 221.6-226.3 V
 Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into six chamber, the uttermost standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WC-T20.

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

2. Reference Standard Information:

Institution	Model	Instrument No.	Certificate No.	Doc Date
TC	TYPE T	TN221-TN230	T210008	08 June 2022
TC	TYPE T	TN231-TN240	T210008	08 June 2022
DATA LOGGER	T4970A	T149	T210008	08 June 2022

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 7703) CALIBRATION 0244

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 2 Hour 25 Minute At 95 °C

Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max

☐ Close ☒ Not Available

5. Adjustment:

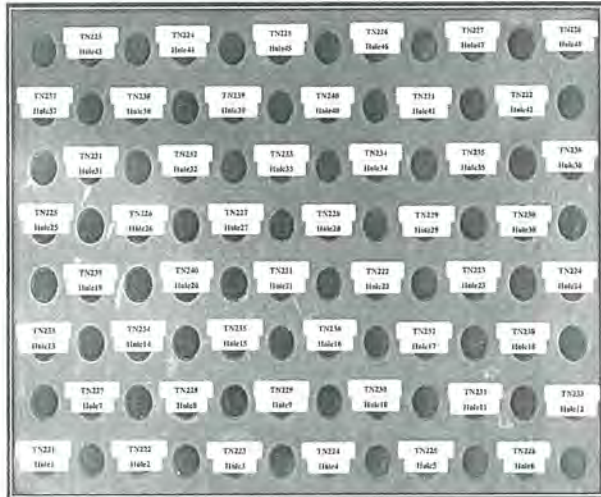
☐ without adjustment

☒ after adjustment

Approved By: [Signature]

FM-112-009-05-21

Calibration Report



FRONT CONTROL

Approved By. 

FM-L13 108/30-05-57

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	93.60	93.82	94.05	94.20	94.36
	Min	93.07	93.26	93.51	93.66	93.82
	Average	93.33	93.54	93.78	93.93	94.09
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	94.59	94.79	94.83	94.55	94.82
	Min	94.05	94.25	94.08	93.97	94.26
	Average	94.32	94.52	94.46	94.26	94.54
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	95.03	94.54	94.78	94.84	95.06
	Min	94.46	93.58	94.30	94.28	94.49
	Average	94.74	94.26	94.49	94.56	94.78
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	94.89	94.82	95.73	95.85	95.73
	Min	94.33	94.26	95.51	95.62	95.51
	Average	94.61	94.54	95.62	95.73	95.62
R5 Hole25-Hole30	TN245	TN246	TN247	TN248	TN249	TN250
	Max	96.28	96.39	96.37	96.54	96.19
	Min	96.01	96.10	96.02	96.20	95.89
	Average	96.15	96.24	96.20	96.37	96.04
R6 Hole31-Hole36	TN251	TN252	TN253	TN254	TN255	TN256
	Max	96.84	96.97	97.03	96.48	96.33
	Min	96.53	96.65	96.71	96.08	95.98
	Average	96.68	96.81	96.87	96.28	96.16
R7 Hole37-Hole42	TN257	TN258	TN259	TN260	TN261	TN262
	Max	96.46	96.15	96.19	96.06	96.05
	Min	96.13	95.84	95.85	95.72	96.04
	Average	96.30	95.99	96.02	95.89	96.02
R8 Hole43-Hole48	TN263	TN264	TN265	TN266	TN267	TN268
	Max	96.91	96.58	96.13	96.19	96.34
	Min	96.55	96.21	95.80	95.87	96.03
	Average	96.73	96.40	95.96	96.03	96.18

Approved By. 

FM-L13 108/30-05-57

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	104.47	104.65	104.79	105.31	105.47
	Min	104.15	104.27	104.43	104.98	105.14
	Average	104.31	104.46	104.62	105.15	105.31
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	105.55	105.73	105.65	105.84	105.97
	Min	105.28	105.43	105.35	105.52	105.68
	Average	105.42	105.58	105.50	105.68	105.82
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	106.14	106.05	105.81	106.05	105.81
	Min	105.85	105.81	105.55	105.80	105.53
	Average	106.00	105.94	105.68	105.92	105.67
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	105.86	105.60	104.44	104.51	104.28
	Min	105.61	105.37	104.27	104.35	104.12
	Average	105.74	105.48	104.35	104.43	104.20
R5 Hole25-Hole30	TN245	TN246	TN247	TN248	TN249	TN250
	Max	104.94	104.85	104.97	105.08	104.68
	Min	104.77	104.75	104.76	104.90	104.51
	Average	104.85	104.84	104.86	104.90	104.59
R6 Hole31-Hole36	TN251	TN252	TN253	TN254	TN255	TN256
	Max	105.44	105.45	105.61	104.95	104.84
	Min	105.27	105.27	105.44	104.76	104.66
	Average	105.36	105.36	105.53	104.86	104.75
R7 Hole37-Hole42	TN257	TN258	TN259	TN260	TN261	TN262
	Max	105.17	104.70	104.59	104.51	105.22
	Min	105.00	104.53	104.41	104.35	105.04
	Average	105.08	104.62	104.50	104.43	105.13
R8 Hole43-Hole48	TN263	TN264	TN265	TN266	TN267	TN268
	Max	105.61	105.45	105.10	104.77	104.87
	Min	105.44	105.28	104.92	104.60	104.70
	Average	105.53	105.37	105.01	104.69	104.79

Approved By. 

FM-L13 108/30-05-57

Calibration Report

Measurement Results

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (±°C)	Uncertainty (±°C)
	Min, Max	Average		
100.0	100.0, 100.4	100.1	0.29	0.33
105.0	105.0, 105.4	105.1	0.20	0.26

* The quoted uncertainty exclude "repeatability"

This calibration result apply only the above enlisted 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 distribution, providing a level of confidence of approximately 95 %

Approved By. 

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.
Saraburi Tel : +66 3627 3098 Fax : +66 3627 3100
Bangkok Tel : +668 9205 8851 , +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T221644

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cold Room)
Manufacturer : KOLDTECH
Model : KM 320
Serial No. : TBN-1012061/05
Customer Code : BKK_EN0167
ID No. : T2463A3
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Environmental Laboratory
Date of Receipt : 27 June 2022
Calibrated By : Sujjar Naknakred (Site Calibration Manager)
Approved By : [Signature] / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 04 JUL 2022

REVIEW BY [Signature]
APPROVED BY [Signature]
NEXT CAL DATE 30/12/23

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.

FM-L14 11/10/10-64



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



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 results of calibration :

- This equipment was calibrated by insert nine standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 (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	34970A	T149	T210009	30 July 2022
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS1-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
☐ Close
☒ Not Available
- Adjustment :
() without adjustment (X) after adjustment

Approved By [Signature]

FM-L12 11/15-08-63



Metrological Center

SCI ECO Services Company Limited

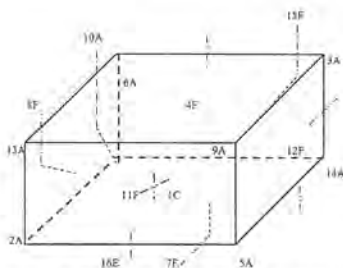
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T221644

Page 3 of 4

Calibration Report



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

1C =	TN161
2A =	TN162
3A =	TN163
4F =	TN164
5A =	TN165
6A =	TN166
7F =	TN167
8F =	TN168
9A =	TN169
10A =	TN170

11F =	TN171
12F =	TN172
13A =	TN173
14A =	TN174
15F =	TN175
16E =	TN176

Approved By [Signature]

FM-L15 11/15-05-63



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



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	TN169
3	2.71	2.82	2.75	2.89	2.95	3.68	3.02	2.96	3.03
	TN171	TN172	TN173	TN174	TN175	TN176			
	2.97	3.02	2.85	3.04	2.97	3.33			

Chamber (Cold Room)		Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)
	Min, Max	Average				
3.0	2.9 - 4.0	3.2	2.97	1.05	1.30	1.66

* 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]

FM-L15 11/15-05-63

REVIEW BY	สมิทธิ T
APPROVED BY	สมิทธิ N
NEXT CAL. DATE	24/05/14

Maintenance Protocol

Atomic Fluorescence Spectrometer mercur DUO / mercur DUO plus

Serial-No.: K170A0143 Customer-No.:
Date: 24 May 2023 Carried out by: Srichai Fak-on

Maintenance with following Operational Qualification (OQ)
(requires a separate OQ protocol) ☐

Company	บริษัท เอลแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด
User	
Department	ห้องแล็บปฏิบัติการ
Street	104 ซอย 40 ถนนพัฒนาการ แขวงสวนหลวง เขตสวนหลวง
Zip Code, City	กรุงเทพมหานคร 10250
Country	ประเทศไทย
Phone	
Fax	
E-mail	

Maintenance works basic unit

- lightness visual check inside the Mercur ☒
- visual check if gold-traps are broken ☒
- visual check if spectrometer is contaminated ☒
- visual check of the fluorescence cell ☒
- visual check of the absorption cell, incl. window ☒
- reactor cleaning ☒
- check pump-hose, if necessary change it ☒
- check swivel drive (SEV) ☒
- check drying-hose, output gas-liquid-separator ☒
- test Bubble-Sensor ☒
- check gas flows ☒
- check volume flows, reagents ☒
- recording stray light values ☒
- measurement with 30 ng/l ☒

Maintenance works Autosampler

Serial No.: 701 739

- lubricate the dosing-winding (Teflon-grease-spray) ☒
- clean the dosing cylinder, if necessary exchange it ☒
- lubricate the winding system of the height drive with some drops of oil ☒
- check the toothed belt ☒
- check the position of the mechanical stopper (height: 13mm) ☒
- check the pump rate of mixing pump (<14s AS52, typ.7s/<20s AS52S, typ.10s) ☒
- check the pump rate of washing cup ☒
- check the electrical hose connections for good contact ☒
- check the connectors of the magnetic valves ☒
- check the dosing hose for buckling, if necessary exchange it ☒

Device parameter	nominal value	actual value
visual check general lightness inside the Mercur	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
visual check Goldtraps	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
visual check spectrometer		
Fluorescence cell	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
Absorption cell, incl. window	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
lens	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
Swivel drive (SEV)	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
check pump hoses	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
check hoses and hose connectors	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
check and clean reactor	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
check drying hose output Gas-liquid-separator	o.k.	<input checked="" type="checkbox"/> changed: <input type="checkbox"/>
check bubble-sensor	o.k.	<input checked="" type="checkbox"/> not o.k.: <input type="checkbox"/>
Check gasflow		
Argon pressure valve 4	1.2 – 1.5 bar	1.5 bar
Valve 1	10 Nl/h or 0.106 NL/min	0.163 NL/min
Valve 2	50 Nl/h or 0.833 NL/min	0.403 NL/min
Valve 3	5 Nl/h or 0.083 NL/min	0.140 NL/min
Valve 4	10 Nl/h or 0.166 NL/min	0.108 NL/min
Check liquidflow		
Acid	2.5ml/min ± 1 ml	2.5 ml/min
Red.-agent	2.5ml/min ± 1 ml	2.5 ml/min
Sample	10ml/min ± 2 ml	10 ml/min
Adventitious light - values		
(V)	from file	
100	0	0
200	0	0
300	0	0
350	0	0
400	0	0
450	2	2
500	5	5
550	10	10
575	15	14
600	20	20

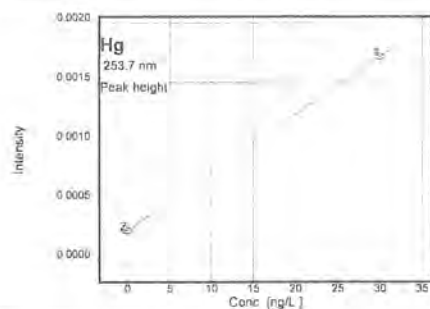
Calibration function 1 5/24/2023 12:44 Calibration (Peak height)

Ints=k1+k2*conc

k1=0.000249 k2=0.000049

Recal. factor

Slope	0.0005 Ints/(ng/L)	R2-adjusted	0.0000
sc0	1.00000 ng/L		
Lower limit	0 ng/L	Upper limit	33.0 ng/L
Detection limit	---	Deter. limit	---



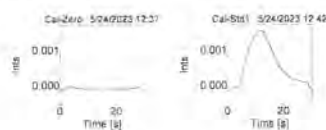
Measurements and events (sorted by time)

Hg ID	Without enrichment / FBR 30ng/L_PM 24052023					5/24/2023	12:35	
	Conc.	Ints	BG	SD	RSD/%	Int. type	Time	
Cal-Zero		0.000143				PkH	12:37	
		0.000397					12:38	
		0.000207					12:40	
	0ng/L	0.000249		0.0001324	53.13		12:40	
Cal-Std1		0.001720				PkH	12:42	
		0.001712					12:43	
		0.001726					12:44	
	30.00ng/L	0.001720		0.00007897	0.459		12:44	
Calibration	Calibration function: 01							12:44

Mercur

Peak plots

Hg



Mercur

Report file: C:\WinAA\ASITMP\2023\May\Pro_033

Program version: 4.7.10.0 Printed on: 5/24/2023 14:01

Operator: PSU,OTA Recording started on: 5/24/2023 13:37 GMT+7.0

Laboratory: AL S-9KK

Code: IL_Hg095_2023

Remarks:

Food/water:

Method parameters

Method: Enrichment / FBR 30ng/L PM 24052023

Created on: 5/24/2023 Time: 13:36

Program: ---

Parameters Mercur Technique: Hg fluorescence

Line	253.7 nm		
Lamp type	Hg-LP		
Integr. mode	Peak height	Integr. time	40 s
PMT	352 V	Peak smoothing	12/11
AZ time	5 s		
Delay	0 s		

Working mode	Ent. w/o reload	System cleaning	Off
FBR technique	off	Wash time acid	10 s
Pump speed	3	Soaking time	20 s
Sample load time	10 s	Gas load time	10 NL/h
Reaction time	10 s		
Waiting time AZ	10 s	Gas AZ wait	10 NL/h
Purge time1	30 s		
Purge time2	15 s	Gas wash time2	5 NL/h
Purge time3	20 s		
Heat time coll.1	20 s	Cool. time coll.1	30 s

Hg

Mercur

QC parameters

QC type	Conc. check		
QC check samp. 1	---	QC check samp. 2	---
Conc.	---	Conc.	---
Error limit	---	Error limit	---
Rep. measurement	off	Reaction	flag + continue
QC std. 1 no.	1(30.000 ng/L)	QC std. 2 no.	1(30.000 ng/L)
QC std. 1 limit	± 50.00%	QC std. 2 limit	± 50.00%
QC std. act.	flag + continue		
Expect. blank abs.	0.0100 ± 0.0100	Reaction	flag + continue
QC precision	off	Reaction	off
		QC Recal. factor	Off

Calibration settings

Calib. meth.	Standard calib.	Calibr. unit	ng/L
No. standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
		Recalib. std. no.	---
Output unit	ug/L	Conversion fac.	1000
Calib. stat.	Mean	Meas. cycles	3
		Blind cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	calculated
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	off	Meas. cycles	1
Confd. level	95.4 %	Blind cycles	---
Grubbs stat.	---		

Calibration standards

No	Name	State	Pos	Conc / ng/L	Ints	SD	RSD/%
1	Cal-Zero	(-)	##	0.000	H: 0.003700 A: 0.02531	0.000081 0.000153	2.192 0.607
2	Cal-Std1	(-)	##	30.000	H: 0.01060 A: 0.06689	0.000253 0.002789	2.386 4.136

Hg

Mercur

Calibration function 1

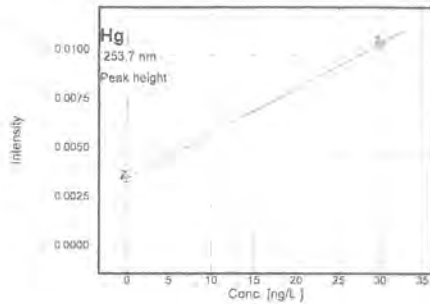
5/24/2023 14:00 Calibration (Peak height)

Ints=k1+k2*conc

k1=0.003700 k2=0.000230

Recal. factor: —

Slope	0.00023 Ints/(ng/L)	R2-adjusted	1.0000
scd	1.00000 ng/L		
Lower limit	0 ng/L	Upper limit	33.0 ng/L
Detection limit	—	Deter. limit	—



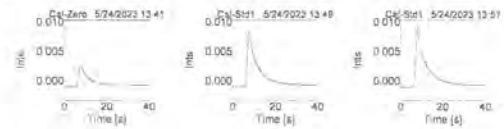
Measurements and events (sorted by time)

Hg ID	Enrichment / FBR 30ng/L PM_24052023	Ints	BG	SD	RSD%	Int. type	Time
Cal-Zero		0.003792				PkH	13:41
		0.003666					13:43
		0.003640					13:44
	0ng/L	0.003700		0.000061060	2.192		13:44
Cal-Std1		0.006469				PkH	13:49
		0.006333					13:50
		0.006051					13:52
	30.00ng/L	0.008931		0.0005830	6.528		13:52
Cal-Std1		0.01031				PkH	13:57
		0.01074					13:58
		0.01076					14:00
	30.00ng/L	0.01060		0.0002530	2.386		14:00
Calibration	Calibration function: 01						14:00

Mercur

Peak plots

Hg



Mercur

Mercur

Report file: C:\WinAAS\TMP\2023\May\Pro_034

Program version: 4.7.10.0

Printed on:

5/24/2023 14:33

Recording started on:

5/24/2023 14:19 GMT+1:0

Operator: PSU,OTA

Laboratory: ALS-BKK

Code: Hg_095_2023

Remarks:

Food water

Method parameters

Method: Without enrichment / Abs / FBR 100ng/L PM 24052023

Created on: 5/24/2023 Time: 14:18

Program: —

Parameters Mercur Technique: Hg absorption

Line	253.7 nm		
Lamp type	Hg-LP		
Integr. mode	Peak height	Integr. time	55 s
PMT	225 V		
AZ time	5 s	Peak smoothing	2/5
Delay	8 s		
Working mode	w/o enrich.	System cleaning	Acid
FBR technique	00	Wash time acid	15 s
Pump speed	4	Soaking time	20 s
Sample load time	8 s	Gas load time	5 NL/h
Reaction time	12 s		
Waiting time AZ	15 s		
Delay	10 s		
Purge time1	50 s		
Purge time2	10 s	Gas wash time2	10 NL/h

Hg

Mercur

QC parameters

QC type	Cond. check
QC check samp. 1	—
Conc.	—
Error limit	—
Rep. measurement	off
QC std. 1 no.	1(100.00 ng/L)
QC std. 1 limit	± 50.00%
QC std. act.	flag + continue
Expect. blank abs	0.0100 ± 0.0100
QC precision	off

QC check samp. 2	—
Conc.	—
Error limit	—
Reaction	flag + continue
QC std. 2 no.	1(100.00 ng/L)
QC std. 2 limit	± 0.00%
Reaction	flag + continue
Reaction	off
QC Recal. factor	Off

Calibration settings

Calib. meth	Standard calib
No. standards	1
Type of standards	—
Output unit	µg/L
Calib. stat.	Mean
Stock sol. 1	—
Stock sol. 3	—
Type of cal. curve	linear
Weighted cal	off
Check of cal. curve	no outlier test

Calibr. unit	ng/L
Conversion fac.	1000000
Standard prep.	Premixed
Blank correct	—
Recalib. std. no.	—
Conversion fac.	1000
Meas. cycles	3
Blind cycles	1
Stock sol. 2	—
Stock sol. 4	—
Intercept	calculated
Grubbs stat.	off

Sample statistics

Stat. mode	Mean
Confd. level	95.4 %
Grubbs stat.	—

Meas. cycles	2
Blind cycles	1

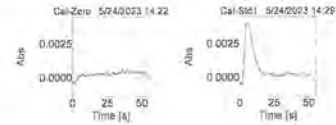
Calibration standards

Hg

No	Name	State	Pos	Conc./ng/L	Abs	SD	RSD/%
1	Cal-Zero	(-)	##	0.00	H: 0.000932 A: 0.035926	0.000138 0.006206	14.88 17.28
2	Cal-Std1	(-)	##	100.00	H: 0.004494 A: 0.061286	0.000116 0.001275	2.586 2.062

Mercur

Mercury



 <p>Archemica</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;"> <small>VIEWED BY</small> <u>Awichai Tawon S</u> </td> </tr> <tr> <td style="padding: 5px;"> <small>APPROVED BY</small> <u>Siraporn M</u> </td> </tr> <tr> <td style="padding: 5px;"> <small>TEST CAL. DATE</small> <u>13 Jun 99</u> </td> </tr> </table>	<small>VIEWED BY</small> <u>Awichai Tawon S</u>	<small>APPROVED BY</small> <u>Siraporn M</u>	<small>TEST CAL. DATE</small> <u>13 Jun 99</u>
<small>VIEWED BY</small> <u>Awichai Tawon S</u>				
<small>APPROVED BY</small> <u>Siraporn M</u>				
<small>TEST CAL. DATE</small> <u>13 Jun 99</u>				

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: Mr. Nudnani Laekhwan

(Mr. Nudnani Laekhwan)

Application Chemist

Date: Jan 12, 2023



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2205-040400-2
Procedure Used :-

Cert. No.: 22TM676
Page: 2 of 3

Calibration were 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:-

Instrument Model Serial No. Cert. No. Due Date
1) Data Acquisition 34872A MYS7013823 22LM24 26 Feb 2023

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

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

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**
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)
It does not cover autoclaves for use with material infect 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		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	55	220
Finished of Calibration	26	57	221

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	15-17TC-11
2 =	Temperature sensor	19-17TC-12
3 =	Exhaust port	19-17TC-13

Signature

a-1109670



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2205-040400-2
Result of Calibration :- (*) Without Adjustment

Cert. No.: 22TM570
Page: 1 of 3

Operating parameter Set : Temperature = 108 °C
Sterilization period = 10 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
108	108	1	107.536	0.19	0.04	0.81	2
		2	107.542				
		3	107.471				

Operating parameter Set : Temperature = 115 °C
Sterilization period = 20 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
115	115	1	114.502	0.15	0.08	0.69	2
		2	114.592				
		3	114.539				

Operating parameter Set : Temperature = 118 °C
Sterilization period = 10 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
118	118	1	117.517	0.094	0.08	0.86	2
		2	117.516				
		3	117.530				

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 121 °C
Sterilization period = 30 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
121	121	1	120.400	0.18	1.1	0.90	2
		2	120.511				
		3	120.465				

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

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

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

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Signature

a-1109669



TECHNICAL PURIFICATION ASSOCIATION (THAI) AND JAPAN
CORPORATE SERVICES & EQUIPMENT CALIBRATION (AJCS) JAPAN
114-1 JIYU-CHO, SHIBUYA-KU, TOKYO 151-8501, JAPAN
TEL: 03-3487-5111 FAX: 03-3487-5112



Cert. No.: 22TM102
Page: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : SHEL-LAB

Model : 1915A

Serial No. : 0200599

ID No. : BKK_ML0010

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Klong Phatthanakan, Khlong Suai Luang
Bangkok 10250 Thailand

Location : Incubation & Micrological Reading

Received Order : 21 January 2022

Calibration Date : 21 January 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Kinde Malee

Approved by : *Signature*
Approved Signatory

() Pornthipai Taneyakul

() Malee Butkuee

() Suwit Itinai

Issue Date : 2 February 2022

The Uncertainty are for a confidence probability of approximately 95%

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

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a-1092377



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2201-061800-1
Procedure Used :-

Cert. No.: 22TM102
Page: 2 of 3

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date
1) Data Acquisition 34872A MYS7013711 21LM7 16 Jun 2022

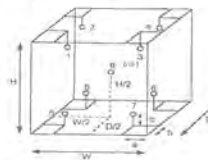
2. This certificate is valid only to the item calibrated on date and place of calibration

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 10 cm b = 10 cm c = 10 cm
D = 0.90 m
W = 0.75 m
H = 1.2 m
Capacity = 0.81 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	25
REL Humid. (%)	53	54
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-06
7	18-18RTD-07
8	18-18RTD-08
9 (Ref.)	18-18RTD-09

Signature

a-1092309



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2201-06180C-1
 Result of Calibration : () Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close

Cert. No.: 22TM102
 Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor
35.0	35.0	35.0	0.043	0.41	0.42	0.30	2

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation
UUC* : Unit Under Calibration

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

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

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1092308



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND)-JAPAN
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
 104 Phatthanakan 40, Phatthanakan Rd.,
 Klongkhan Phatthanakan, Khet Suan Luang,
 Bangkok 10250 Thailand
 (Tel. 0 271 099000) FAX 0 27199900



Cert. No.: 22TM1571
 Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Binder

Model : ED 240/E2

Serial No. : D0-15533

ID No. : BKH_ML0013

Submitted by :

Location :

Received Order :

Calibration Date :

Ambient Temperature :

Relative Humidity :

Calibrated by :

Approved by :

() Pornthippa Tameyakul
 (✓) Malee Butkrus
 () Sowit Imjai

Issue Date :

The uncertainties are for a confidence probability of approximately 95%

For information only, this certificate is not valid for use as evidence of conformity with a specification or standard unless it is accompanied by a copy of the specification or standard.

1048150



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2211-06230C-1
 Procedure Used :

Calibration were conducted using calibration procedure GP-OT02 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:-

Instrument : Model : Serial No. : Cert. No. : Due Date :
 1) Data Acquisition : 34870A : MY44067817 : 22LM121 : 22 Aug 2023

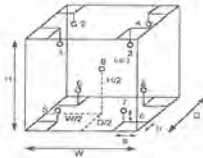
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration : () After Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

Dimension of Chamber :
 a = 5.0 cm
 b = 5.0 cm
 c = 5.0 cm
 d = 0.50 m
 W = 0.80 m
 H = 0.80 m
 Capacity = 0.24 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	53	55
AC Supply (Volt)	219	220

Position :	Ref. Std. ID No.:
1	21-15TC-01
2	21-15TC-02
3	21-15TC-03
4	21-15TC-04
5	21-15TC-05
6	21-15TC-06
7	21-15TC-07
8	21-15TC-08
9 (ref.)	21-15TC-09

1138049



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2211-06230C-1
 Result of Calibration : () After Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 22TM1571
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor
180	180	180	0.70	1.5	2.9	1.4	2

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation
UUC* : Unit Under Calibration

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

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

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1138053



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
314 CHATTANAKARN RD. SUKHUMVIT 25, SUKHUMVIT, BANGKOK 10110
TEL: 02-2713 3992 FAX: 02-27197454



Cert. No.: 23TM/637
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 45
Serial No. : L712.0428
ID No. : BKK_ML0056

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : Incubator & Microbiological Reading

Received Order : 20 April 2023
Calibration Date : 20 April 2023
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Kuntarat Prampat

Approved by :
Approved Signatory

() Ponthipap Tameyakul
() Males Bulkiuss
() Suwit Imjai

Issue Date : 24 April 2023

The 1 uncertainties are for a confidence probability of approximately 95%.

This certificate is not to be reproduced without the approval of the calibration laboratory.
Approved/Reviewed of Certificate Accuracy : High precision Calibration and Testing Services

A-0053357



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2304-0253OC-1
Procedure Used :-

Cert. No.: 23TM/637
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44073381	22LM78/1	12 May 2023

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

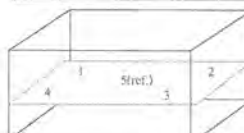
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	($^{\circ}\text{C}$)	(%R.H.)	(Volt)
Beginning of Calibration	25	45	223
Finished of Calibration	25	49	223



Unit

Position :	Ref. Std. S/N.:
1	4803866-006
2	4803868-007
3	4804539-014
4	4804539-015
5(ref.)	4804539-016

Males

A-1158265



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2304-0253OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM/637
Page : 3 of 3

Calibration point ($^{\circ}\text{C}$)	UUC* Setting ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Average* Standard Reading ($^{\circ}\text{C}$)					Uncertainty ($\pm ^{\circ}\text{C}$)
			1	2	3	4	5 (ref.)	
44.5	44.5	44.5	44.482	44.483	44.475	44.510	44.491	0.15
45.0	45.0	45.0	45.005	44.992	44.979	45.016	44.986	0.15

Calibration point ($^{\circ}\text{C}$)	Uniformity ($^{\circ}\text{C}$)	Stability ($\pm ^{\circ}\text{C}$)	Coverage Factor k
44.5	0.051	0.022	2
45.0	0.080	0.026	2

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

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

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

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

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Males

A-1158264

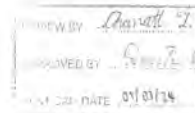
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Agilent
CrossLab

From Knight to Quantum

Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES
Preventive Maintenance



Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Revision A 02, issued 21 January 2022
Document Number: 68014-90075
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Agilent

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.
- For customers using HF applications, the instrument should be returned to its standard sample introduction system.

Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/em-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- Need to place a service call?** Flexible Repair Options | Agilent

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Service not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page.
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section.
- Ask the customer to sign the Service Verification section including the customer's and your signature.

Instrument Maintenance

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing this table.

Instrument System Name and ID	G9010A ; M416010005
Instrument System Site and Location	A15 (UK)

List System Component	Product Numbers	List the Serial Numbers of each Component
1	G9010A	M416010005
2	G9410A	AU16440964
3	G9711	3005 - 00159
4	G9485	AU16040115
5		
6		
7		
8		
9		

ICP-OES Configuration Table	Circle the type or write in the type if other
Nebulizer Type	SeaSpray OneNeb Conical Other
Spray Chamber	Cyclonic Single Pass Cyclonic Double Pass Other
Torch	Radial Quil View Other
Torch Type	One Piece Semi Dismountable Fully Dismountable Other
Injector Diameter	2.4mm 1.8mm 1.4mm 0.8mm Other
Injector Material	Quartz Ceramic Other

Preparation

- ☒ Discuss any specific issues with the customer before starting
- ☒ Review the instrument logbook for recorded problems and comments
- ☒ Save instrument control settings before starting the procedure
- ☒ Perform a general inspection of the system for cleanliness
- ☒ Check for proper installation of parts, assemblies, sensors etc
- ☒ Check system for required installation of components and implementation of Service Notes
- ☒ Check for required firmware/software updates and verify with customers if they would like them installed
- ☒ For HP application systems: If standard sample introduction system was not installed, gain the customer to install it
- ☐ Ask the customer to remove any samples from the ICP-OES sample introduction area, auto sampler or around the ICP-OES

Preventive Maintenance Procedures

Record Pre-PM instrument performance

- ☒ Run Instrument Performance test
- ☒ Record results in Instrument Performance Test Results Table - Pre-PM

Clean and inspect ICP-OES system

- ☒ Look for any obvious external damage or problems
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required
- ☒ Record the instrument operating conditions in the ICP-OES Status Results Table
- ☒ Replace the polychromator purge filter
- ☒ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVDV and VDV instruments
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications
- ☒ Replace air inlet dust filter
- ☒ Replace high capacity air inlet dust filter element if installed
- ☒ Remove and clean instrument water inlet filter

Agilent Water-Recirculator

- ☐ Service not applicable
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Remove, clean and reinstall water inlet metal-mesh filter if present
- ☒ Re fill with Agilent Cool Clear cooling fluid
- ☒ Clean the cooling system Air filter and the condenser

SPS 3 Auto Sampler

- ☒ Service not applicable
- ☐ Power cycle the autosampler and verify successful initialization
- ☐ Inspect X and Z axis belts for wear. Replace is necessary
- ☐ Clean X and Z axis slide shafts
- ☐ Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial

SPS 4 Auto sampler

- ☐ Service not applicable
- ☒ Clean the spill tray, rack location mat, end frames and chassis with a damp soft cloth and diluted mild detergent
- ☒ Clean the auto sampler cover panels if cover kit is installed, with domestic window cleaner
- ☒ Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes
- ☒ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edges or damaged connectors
- ☒ Pump Tubing Replacement: Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles
- ☒ Test using customer's tray and move the sample probe to the sample vial 1, wash vial and rinse port and ensure that the probe is centered in the vial. If not use calibration wizard and calibrate the position

AVS 4, 6, 7 Advanced Valve System

- ☐ Service not applicable
- ☒ Replace valve rotor seal - *Inspect*
- ☒ Check fittings for signs of leaks
- ☒ Check tubing including autosampler tubing for kinks or excessive wear
- ☒ Check high flow pump for signs of leaks

ICP-OES adjustment

- ☒ Check position of Zn peak, adjust if required
- ☒ Check Argon Ratio, adjust to specified value if required
- ☒ Perform Detector Calibration
- ☒ Perform Instrument Calibration

Record Post-PM instrument performance

- ☒ Run Instrument Performance test
- ☒ Record results in Instrument Performance Test Results Table - Post PM
- ☒ For systems using ICP Expert version 7.3 and above, run the following instrument tests

- ☒ Subsystem Communications Test
- ☒ Air Flow
- ☒ Water Flow
- ☒ Gas Flows
- ☒ RF Generator
- ☒ Camera Test
- ☒ Optics Test
- ☒ Nebulizer Test

- ☒ Record the result in the Instrument Test Results Table

Restore Instrument

- ☐ For HF applications, ask the customer to reinstall their sample introduction system.
- ☒ Leave system in an idle state on and purging.
- ☒ Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☐ Complete the Signature Page with both Service Engineer and Customer signatures.

Test Results

Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial*	Radial	Axial*
Zn 213 857 nm SRRR	39603.8	146365.1	39349.9	164369.5
Mn 257 610 nm SRRR	153698.3	620860.3	159380.0	313496.9
Al 396 132 nm SRR	29885.5	300147.7	29985.9	196802.0
K 766 491 nm SRR	99616.9	3151227.6	99999.4	2968984.9

* Axial result is not applicable for G8016AA, G8012AA Radial View instruments

Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flows	Pass
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer test	Pass

ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

Measurement	Standby Mode		Plasma On	
Main Voltage	216.178	VAC	215.135	VAC
Main Current	0.213	A	0.116	A
Instrument Temperature	24.4	°C	24.5	°C
RF Air Flow (sensor speed)	18.0	Hz	20.0	Hz
Plasma Exhaust Temperature	No measurement		43.3	°C
Water Flow Oscillator	No measurement		1.20	L/min
Water Flow Detector	1.12	L/min	1.05	L/min
Water Inlet Temperature	28.0	°C	23.5	°C
Polychromator Temperature	35.0	°C	35.0	°C
QCD Temperature	-40.0	°C	-40.0	°C
Thermal Stabilizer	34.8	°C	35.0	°C
Argon Supply Pressure	615.33	kPa	541.92	kPa
Purge Gas Supply Pressure*1	609.38	kPa	567.33	kPa
Option Gas Supply Pressure*1	—	kPa	—	kPa
Nebulizer Flow	No measurement		0.36	L/min
Nebulizer Back Pressure	No measurement		255.36	kPa
Plasma Gas Flow	No measurement		11.96	L/min
Auxiliary Gas Flow	No measurement		1.0	L/min
RF Power	No measurement		1199.9	W
RF Supply Current	No measurement		9.223	A
RF Supply Voltage	No measurement		194.472	V

*1 If option installed

Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Axial Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8015A	1
Radial Optic Window	G8010-68015	All	1
Agilent Cool Clear Coolant Fluid	5709-0037	Agilent Water Recirculator	—
Purge Gas Filter	G8010-60136	All	1
Air Inlet Filter	G8000-88002	All	1
High Capacity Air Filter	G8010-60189	Optional	—
Rotor seal for 5/7 port valve for AVS47	G8494-60002	G8494A/G8495	—
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	—
Rinse solution to hose station 2.5mm id x 1m	G8410-80123	SPS 4	1
Barb connector 2.5mm x 1.5mm ID	G8410-80124	SPS 4	1
PVC waste tubing 6mm od x 3mm id, 2m	G8410-80122	SPS 4	1

Additional Parts may be required from engineer's stock:

k axis drive belt	5410047500	SPS 3	—
Z axis drive belt	5410047400	SPS 3	—
Peristaltic pump tubing, PVC Somaflex, 3 m long	3710049000	SPS 4	—

Consumed Parts Reference

(Purchased by customer, not included as part of PM)

☐ Section Not Applicable

Part Description	Part Number	Product or Model# where used	Quantity consumed
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Signature Page

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

- During PM found water tubing in instrument broken then water leaking inside instrument.
- Replace all water tube inside instrument, after replace found water flow sensor water leak also.
- Replace water module and continue PM without deviation.

Service Verification

Service Request Number: 6005503634

Date Service Completed: 2 - May - 2023

Service Engineer Name: Gurin Ngannvjit

Customer Name: Thitiya Kaitpony

Service Engineer Signature: Gurin Ng.

Customer Signature: Thitiya K.

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