

ภาคผนวก ง

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0665	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0668	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0185	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0667	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0397	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	RYG_EN0001	3-Feb-26	3-Feb-27	12
Ambient	Total Suspended Particulate	High Volume	RYG_FS0396	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0664	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0177	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0663	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0396	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	3-Feb-26	3-Feb-27	12
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	BKK_FS0797	5-Jan-26	5-Jul-26	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0255	5-Jan-26	5-Jul-26	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0272	5-Jan-26	5-Jul-26	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_FS0252	5-Jan-26	5-Jul-26	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0263	5-Jan-26	5-Jul-26	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0254	5-Jan-26	5-Jul-26	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0271	5-Jan-26	5-Jul-26	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0251	5-Jan-26	5-Jul-26	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0085	15-Jan-25	15-Jul-26	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0143	23-Feb-26	22-Aug-27	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0530	20-Feb-26	19-Aug-27	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0141	23-Feb-26	22-Aug-27	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0328	8-May-25	7-Nov-26	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0215	8-Oct-25	7-Oct-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0629	21-Jan-26	20-Jan-27	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0717	8-Oct-24	8-Apr-26	18
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0628	21-Jan-26	20-Jan-27	12
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0216	19-Aug-25	18-Aug-26	12
Noise	Leq 24 hrs	Sound Level Meter	NNG_FS0023	21-Jul-25	20-Jul-26	12
Noise	Leq 24 hrs	Sound Level Meter	PHK_FS0032	21-Jul-25	20-Jul-26	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0628	21-Jan-26	20-Jan-27	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0129	14-Jul-25	14-Jul-26	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0131	14-Jul-25	14-Jul-26	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0133	14-Jul-25	14-Jul-26	12
Noise	Noise Annoyance	Sound Calibrator	RYG_FS0216	19-Aug-25	18-Aug-26	12
Noise	Noise Annoyance	Sound Level Meter	NNG_FS0023	21-Jul-25	20-Jul-26	12
Noise	Noise Annoyance	Sound Level Meter	PHK_FS0032	21-Jul-25	20-Jul-26	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0628	21-Jan-26	20-Jan-27	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0129	14-Jul-25	14-Jul-26	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0131	14-Jul-25	14-Jul-26	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0133	14-Jul-25	14-Jul-26	12
Noise	Noise Annoyance	Sound Level Meter	SRT_FS0020	4-Aug-25	3-Aug-26	12
Noise	Noise Annoyance	Sound Level Meter	NNG_FS0024	4-Aug-25	4-Aug-26	12
Noise	Noise Annoyance	Sound Level Meter	RYG_FS0629	21-Jan-26	20-Jan-27	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0134	14-Jul-25	14-Jul-26	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0136	14-Jul-25	14-Jul-26	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0135	14-Jul-25	14-Jul-26	12
Noise	Leq 5 min	Sound Calibrator	RYG_FS0216	19-Aug-25	18-Aug-26	12
Noise	Leq 5 min	Sound Level Meter	NNG_FS0023	21-Jul-25	20-Jul-26	12
Noise	Leq 5 min	Sound Level Meter	PHK_FS0032	21-Jul-25	20-Jul-26	12
Noise	Leq 5 min	Sound Level Meter	RYG_FS0628	21-Jan-26	20-Jan-27	12
Noise	Leq 5 min	Sound Level Meter	NKH_FS0129	14-Jul-25	14-Jul-26	12
Noise	Leq 5 min	Sound Level Meter	NKH_FS0131	14-Jul-25	14-Jul-26	12
Noise	Leq 5 min	Sound Level Meter	NKH_FS0133	14-Jul-25	14-Jul-26	12
Rayong Lab	Nitrate	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Ammonia Nitrogen	SPECTROPHOTOMETER	RYG_EN0037	18-Mar-25	18-Sep-26	18



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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	20-Jan-25	20-Jul-26	18
Rayong Lab	BOD	Incubator	RYG_EN0154	18-Mar-26	18-Sep-27	18
Rayong Lab	BOD	Burette	RYG_EN0216	18-Sep-25	18-Sep-26	12
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Phenol	SPECTROPHOTOMETER	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	pH at 25 °C	pH Meter	RYG_EN0152	18-Jun-25	18-Dec-26	18
Rayong Lab	Cyanide	SPECTROPHOTOMETER	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Sulfide	Chamber (Cold Room)	RYG_EN0184	27-Nov-25	27-May-27	18
Rayong Lab	Dissolved Oxygen (on site)	DO Meter	RYG_FS0603	22-Sep-25	22-Sep-26	12
Rayong Lab	Dissolved Oxygen	Chamber (Cold Room)	RYG_EN0184	27-Nov-25	27-May-27	18
Rayong Lab	Temperature	pH meter	RYG_FS0550	18-Jul-25	18-Jul-26	12
Rayong Lab	Color (at Original pH)	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Color (at pH 7.0)	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Conductivity	Conductivity meter	RYG_EN0200	1-Dec-25	1-Dec-26	12
Rayong Lab	Formaldehyde	SPECTROPHOTOMETER	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0003	3-Feb-26	3-Feb-27	12
Rayong Lab	Oil & Grease	Liquid Bath (Water)	RYG_EN0220	27-Nov-25	27-Nov-26	12
Rayong Lab	Salinity	Conductivity meter	RYG_EN0200	1-Dec-25	1-Dec-26	12
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0163	3-Feb-26	3-Feb-27	12
Rayong Lab	Total Dissolved Solids 180°C	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Total Kjeldahl Nitrogen	Block Digestion Unit	RYG_EN0188	10-Sep-25	10-Mar-27	18
Rayong Lab	Total Kjeldahl Nitrogen	pH Meter	RYG_EN0152	18-Jun-25	18-Dec-26	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0163	3-Feb-26	3-Feb-27	12
Rayong Lab	Total Suspended Solids	Chamber (Oven)	RYG_EN0012	10-Sep-25	10-Mar-27	18
Rayong Lab	Arsenic	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Arsenic	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Cadmium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Cadmium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Copper	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Copper	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Lead	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Lead	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Manganese	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Manganese	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Nickel	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Nickel	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Zinc	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Zinc	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Mercury	Mercury Analyzer	RYG_EN0223	21-Jul-25	21-Jul-26	12
Rayong Lab	Hexavalent Chromium	Spectrophotometer	RYG_EN0037	18-Mar-25	18-Sep-26	18
Rayong Lab	Aluminium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Aluminium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Barium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Barium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Iron	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Iron	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Selenium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Selenium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Trivalent Chromium	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Trivalent Chromium	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Rayong Lab	Silver	ICP-OES	RYG_EN0224	22-Aug-25	22-Aug-26	12
Rayong Lab	Silver	Hot Block	RYG_EN0227	4-Nov-25	4-Nov-26	12
Water Lab	Total Coliform	Autoclave	BKK_ML0041	4-Mar-25	4-Sep-26	18
Water Lab	Total Coliform	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26	12
Water Lab	Total Coliform	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27	18



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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	4-Mar-25	4-Sep-26	18
Water Lab	Fecal Coliform	Incubator	BKK_ML0231	21-Aug-25	21-Aug-26	12
Water Lab	Fecal Coliform	Hot Air Oven	BKK_ML0013	9-Oct-25	9-Apr-27	18
Water Lab	Fecal Coliform	Water Bath	BKK_ML0056	4-Feb-26	4-Feb-27	12
Sludge	Aluminium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Aluminium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Aluminium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Barium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Barium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Barium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Lead	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Lead	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Lead	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Mercury	Mercury Analyzer	BKK_EL0128	27-Nov-25	27-Nov-26	12
Sludge	Iron	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Iron	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Iron	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Manganese	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Manganese	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Manganese	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Copper	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Copper	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Copper	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Nickel	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Nickel	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Nickel	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Arsenic	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Arsenic	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Arsenic	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Selenium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Selenium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Selenium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Cadmium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Cadmium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Cadmium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Zinc	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Zinc	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Zinc	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Trivalent Chromium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Sludge	Trivalent Chromium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Sludge	Trivalent Chromium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Sludge	Hexavalent Chromium	Spectrophotometer	BKK_EN0356	8-Oct-25	8-Oct-26	12
Soil	Mercury	Mercury Analyzer	BKK_EL0128	27-Nov-25	27-Nov-26	12
Soil	Arsenic	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Arsenic	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Arsenic	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Barium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Barium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Barium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Cadmium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Cadmium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Cadmium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Copper	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Copper	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Copper	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18



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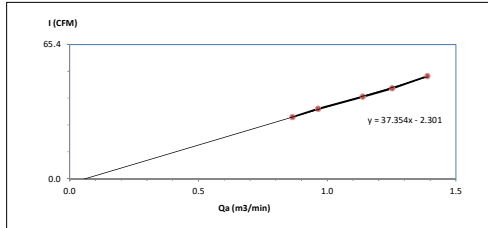
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Soil	Iron	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Iron	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Iron	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Lead	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Lead	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Lead	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Manganese	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Manganese	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Manganese	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Aluminium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Aluminium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Aluminium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Nickel	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Nickel	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Nickel	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Selenium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Selenium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Selenium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Silver	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Silver	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Silver	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Trivalent Chromium	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Trivalent Chromium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Trivalent Chromium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Zinc	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	Zinc	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	Zinc	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	Cation Exchange Capacity	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	SAR	ICP-OES	BKK_EL0037	23-Feb-26	22-Feb-27	12
Soil	SAR	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Soil	SAR	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Soil	pH aqueous phase 50% (w/v)	pH meter	BKK_EN0342	9-Oct-25	9-Oct-26	12
Soil	Hexavalent Chromium	Spectrophotometer	BKK_EN0356	8-Oct-25	8-Oct-26	12



High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
Calibrate Location : 155/155/155/155/155/155 (A1)
Calibrate Date : 21-Feb-26
CalibrationSheet No.: C-210226-RYG_FS0665
Calibrator ID: RYG_FS0205
Calibrator Model: TE-5028A
Calibrator S/N: 1166
Barometric Pressure (mm Hg) : 755.3
Temperature (°C): 32.6
High Volume ID: RYG_FS0665
High Volume Model: TE-5009X
High Volume S/N: 6264
Calibrator Slope: 0.95091
Calibrator Intercept: -0.01856

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I: Chart (CFM)	Linear Regression
1	1.6	0.865	30	Slope : 37.3544 Intercept : -2.3010 Correlation Coefficient : 0.9990
2	2.0	0.965	34	
3	2.8	1.138	40	
4	3.4	1.252	44	
5	4.2	1.389	50	



Calibrated by :
(Mr. Panuwat Wanghong)
RYG Field Services Scientist (1)

Approved by :
(Mr. Supot Salameh)
Field Services Section Head

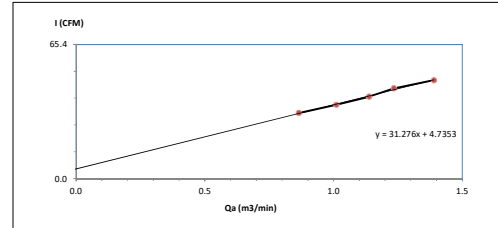
FORM NO.: F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
Calibrate Location : 155/155/155/155/155/155 (A1)
Calibrate Date : 24-Apr-26
CalibrationSheet No.: C-240426-RYG_FS0668
Calibrator ID: RYG_FS0205
Calibrator Model: TE-5028A
Calibrator S/N: 1166
Barometric Pressure (mm Hg) : 754.5
Temperature (°C): 32.4
High Volume ID: RYG_FS0668
High Volume Model: TE-5009X
High Volume S/N: 6267
Calibrator Slope: 0.95091
Calibrator Intercept: -0.01856

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I: Chart (CFM)	Linear Regression
1	1.6	0.865	32	Slope : 31.2763 Intercept : 4.7353 Correlation Coefficient : 0.9976
2	2.2	1.011	36	
3	2.8	1.138	40	
4	3.3	1.234	44	
5	4.2	1.390	48	



Calibrated by :
(Mr. Panuwat Wanghong)
RYG Field Services Scientist (1)

Approved by :
(Mr. Supot Salameh)
Field Services Section Head

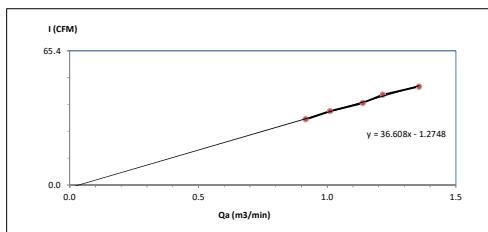
FORM NO.: F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
Calibrate Location : 155/155/155/155/155/155 (A2)
Calibrate Date : 24-Apr-26
CalibrationSheet No.: C-240426-RYG_FS0185
Calibrator ID: RYG_FS0205
Calibrator Model: TE-5028A
Calibrator S/N: 1166
Barometric Pressure (mm Hg) : 754.5
Temperature (°C): 32.4
High Volume ID: RYG_FS0185
High Volume Model: TE-5009X
High Volume S/N: 4793
Calibrator Slope: 0.95091
Calibrator Intercept: -0.01856

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I: Chart (CFM)	Linear Regression
1	1.8	0.916	32	Slope : 36.6084 Intercept : -1.2748 Correlation Coefficient : 0.9967
2	2.2	1.011	36	
3	2.8	1.138	40	
4	3.2	1.215	44	
5	4.0	1.357	48	



Calibrated by :
(Mr. Panuwat Wanghong)
RYG Field Services Scientist (1)

Approved by :
(Mr. Supot Salameh)
Field Services Section Head

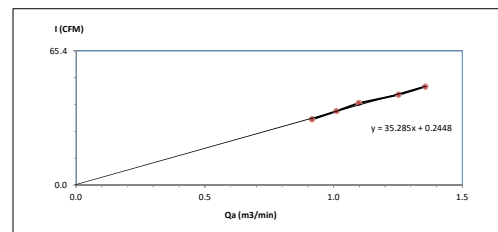
FORM NO.: F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
Calibrate Location : 155/155/155/155/155/155 (A3)
Calibrate Date : 24-Apr-26
CalibrationSheet No.: C-240426-RYG_FS0667
Calibrator ID: RYG_FS0205
Calibrator Model: TE-5028A
Calibrator S/N: 1166
Barometric Pressure (mm Hg) : 754.5
Temperature (°C): 32.4
High Volume ID: RYG_FS0667
High Volume Model: TE-5009X
High Volume S/N: 6266
Calibrator Slope: 0.95091
Calibrator Intercept: -0.01856

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I: Chart (CFM)	Linear Regression
1	1.8	0.916	32	Slope : 35.2849 Intercept : 0.2448 Correlation Coefficient : 0.9950
2	2.2	1.011	36	
3	2.6	1.097	40	
4	3.4	1.252	44	
5	4.0	1.357	48	



Calibrated by :
(Mr. Panuwat Wanghong)
RYG Field Services Scientist (1)

Approved by :
(Mr. Supot Salameh)
Field Services Section Head

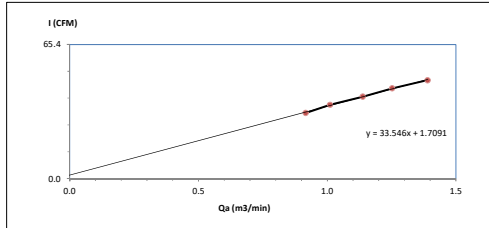
FORM NO.: F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site :	WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.	Barometric Pressure (mm Hg) :	754.5
Calibrate Location :	วัดนาหว้า (A4)	Temperature (°C) :	32.4
Calibrate Date :	24-Apr-26	High Volume ID :	RYG_FS0397
Calibration Sheet No. :	C-240426-RYG_FS0397	High Volume Model :	TE-5009X
Calibrator ID :	RYG_FS0205	High Volume S/N :	5687
Calibrator Model :	TE-5028A	Calibrator Slope :	0.95091
Calibrator S/N :	1166	Calibrator Intercept :	-0.01856

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.9	0.916	32	Slope : 33.5460 Intercept : 1.7091 Correlation Coefficient : 0.9983
2	2.2	1.011	36	
3	2.8	1.138	40	
4	3.4	1.252	44	
5	4.2	1.390	48	



Calibrated by :
(Mr. Panuwat Wanghong)
RYG Field Services Scientist (1)

Approved by :
(Mr. Supot Salameh)
Field Services Section Head

FORM NO.: F 06-074 REVISION NO.2 ISSUE DATE: 20/11/23

SARTORIUS



Accredited by

NSC-TIS-TIS 17025
Calibration 0426

Calibration certificate

Calibration Certificate No. 26BCI0067

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	LA130S-F	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI08.
Serial QM Ident. no.	25409664 RYG_EN0001	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand.	
Order no.	278579	
Number of pages	4	
Date of calibration	03 Feb 2026	



This calibration certificate may not be reproduced other than in full except with the permission of NSC-TIS-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date of issue	03 Feb 2026	Approval of the Calibration Certificate	Person in charge
		Mr. Chonchai Inthana	Chonchai Inthana

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang
10310 Bangkok

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Calibration certificate No. 26BCI0067
Calibration Certificate

Calibration object

Single range instrument

Model	LA130S-F
Serial Number	25409664
QM Ident. no Inventory no.	RYG_EN0001 —
Maximum capacity (Max. load)	150,000 g
Measured up to	150,000 g
Scale interval	0,0001 g

Place of calibration

Address	According to page 1
Department Cost center	Laboratory Department, —
Building Floor	— 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET Calibration Guide No. 18, Version 4.0 (11/2015) - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	Testo 174H H/T250743 (Traceable to Si unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M2508149S_E2(Traceable to SI unit through TCS)	19 Aug 2027

Calibration certificate No. 26BCI0067
Calibration Certificate

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	03 Feb 2026
Temperature at place of calibration Temp. diff.	24,5 °C 0,5 K
Weights - T _{place}	
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 52,0 %RH.

Measurement results | Measurement uncertainties

Repeatability	Eccentricity
Test load (nominal): 10 g 100 g	Test load (nominal): 50 g
10 g	Center
100 g	Front left
1	Back left
2	Back right
3	Front right
4	Maximum deviation from centric loading indication
5	Δ _{ecc} max = 0,0001 g
6	
7	
8	
9	
10	
s = 0,00007 g	s = 0,00007 g

Test load	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
0,0100 g	0,0100 g	0,0000 g	2,00	0,00016 g	1,6 %
0,0500 g	0,0500 g	0,0000 g	2,00	0,00016 g	0,33 %
0,1000 g	0,1000 g	0,0000 g	2,00	0,00016 g	0,16 %
0,5000 g	0,5000 g	0,0000 g	2,00	0,00016 g	0,033 %
1,0000 g	1,0000 g	0,0000 g	2,00	0,00016 g	0,016 %
2,0000 g	2,0000 g	0,0000 g	2,00	0,00017 g	0,0083 %
5,0000 g	5,0001 g	0,0001 g	2,00	0,00017 g	0,0033 %
10,0000 g	10,0001 g	0,0001 g	2,00	0,00017 g	0,0017 %
20,0000 g	20,0000 g	0,0000 g	2,00	0,00017 g	0,00086 %
100,0000 g	100,0001 g	0,0001 g	2,00	0,00023 g	0,00023 %
150,0000 g	150,0001 g	0,0001 g	2,00	0,00030 g	0,00020 %
Maximum error of indication		E _{max} = 0,0001 g			

U_{95(E)} is the quotient of U(E) and test load L. The uncertainty of measurement U(E) is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-16, V4.2. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

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10310 Bangkok

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Uncertainty of measurement in use

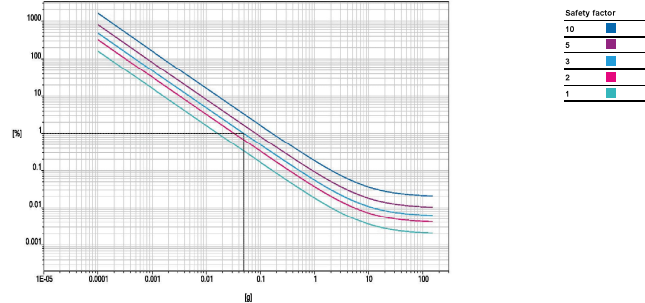
Device adjusted before measurement Yes
 Temperature deviation considered 1,5 K (isoCAL active)
 Temperature coefficient considered $1 \cdot 10^{-4}/K$

Uncertainty of the weighing result $U_{g(W)}$ $U_{g(W)} = 0.00016 \text{ g} + 1.95 \cdot 10^{-4} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{g(W)}$	Uncertainty relative $U_{g(W)}/R$
1 %	1,5000 g	0,00019 g	0,013 %
25 %	37,5000 g	0,00089 g	0,0024 %
50 %	75,0000 g	0,0016 g	0,0022 %
75 %	112,5000 g	0,0024 g	0,0021 %
100 %	150,0000 g	0,0031 g	0,0021 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy 1,00 %
 Safety factor 3
 Minimum sample weight 0,0493 g

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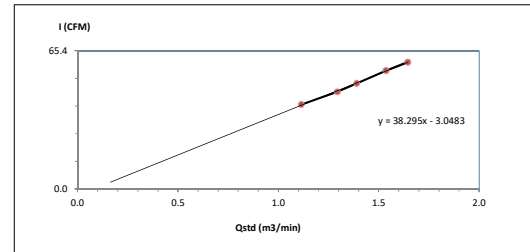
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High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
 Calibrate Location : (A1)
 Calibrate Date : 21-Feb-26
 CalibrationSheet No.: C-210226-RYG_FS0396
 Calibrator ID: RYG_FS0205
 Calibrator Model: TE-S028A
 Calibrator S/N: 1166
 Barometric Pressure (mm Hg) : 755.3
 Temperature (°C) : 32.6
 High Volume ID : RYG_FS0396
 High Volume Model : TE-S170D
 High Volume S/N: 5688
 Calibrator Slope : 1.51825
 Calibrator Intercept : -0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.8	1.1146	40	Slope : 38.2955
2	3.8	1.2936	46	Intercept : -3.0483
3	4.4	1.3897	50	Correlation Coefficient : 0.9991
4	5.4	1.5364	56	
5	6.2	1.6441	60	



Calibrated by Panuwat
 (Mr. Panuwat Wangbong)
 RYG Field Services Scientist (1)

Approved by Supot S
 (Mr. Supot Salameh)
 Field Services Section Head

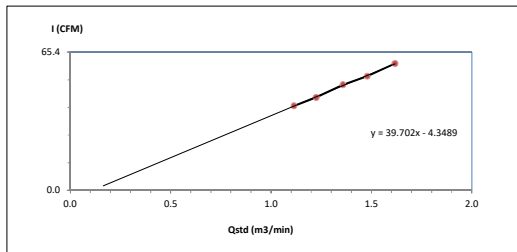
FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
 Calibrate Location : บ้านนาหว้า (A1)
 Calibrate Date : 24-Apr-26
 CalibrationSheet No.: C-240426-RYG_FS0664
 Calibrator ID: RYG_FS0205
 Calibrator Model: TE-S028A
 Calibrator S/N: 1166
 Barometric Pressure (mm Hg) : 754.5
 Temperature (°C) : 32.4
 High Volume ID : RYG_FS0664
 High Volume Model : TE-S009X
 High Volume S/N: 6261
 Calibrator Slope : 1.51825
 Calibrator Intercept : -0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.8	1.1144	40	Slope : 39.7017
2	3.4	1.2250	44	Intercept : -4.3489
3	4.2	1.3582	50	Correlation Coefficient : 0.9991
4	5.0	1.4792	54	
5	6.0	1.6175	60	



Calibrated by Panuwat
 (Mr. Panuwat Wangbong)
 RYG Field Services Scientist (1)

Approved by Supot S
 (Mr. Supot Salameh)
 Field Services Section Head

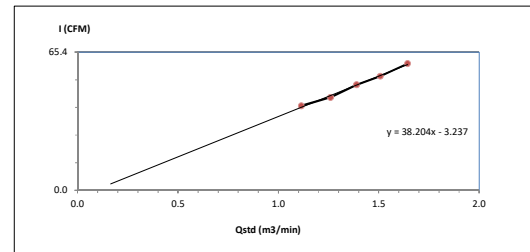
FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
 Calibrate Location : บ้านนาหว้า (A2)
 Calibrate Date : 24-Apr-26
 CalibrationSheet No.: C-240426-RYG_FS0177
 Calibrator ID: RYG_FS0205
 Calibrator Model: TE-S028A
 Calibrator S/N: 1166
 Barometric Pressure (mm Hg) : 754.5
 Temperature (°C) : 32.4
 High Volume ID : RYG_FS0177
 High Volume Model : TE-S170D
 High Volume S/N: 4803
 Calibrator Slope : 1.51825
 Calibrator Intercept : -0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.8	1.1144	40	Slope : 38.2037
2	3.6	1.2596	44	Intercept : -3.2370
3	4.4	1.3894	50	Correlation Coefficient : 0.9969
4	5.2	1.5079	54	
5	6.2	1.6438	60	



Calibrated by Panuwat
 (Mr. Panuwat Wangbong)
 RYG Field Services Scientist (1)

Approved by Supot S
 (Mr. Supot Salameh)
 Field Services Section Head

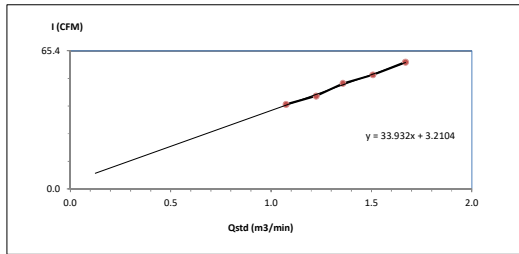
FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
 Calibrate Location : หมู่ที่ 1 บ้านหนองน้ำขุ่น (A3)
 Calibrate Date : 24-Apr-26
 CalibrationSheet No.: C-240426-RYG_FS0663
 Calibrator ID: RYG_FS0205
 Calibrator Model: TE-5028A
 Calibrator S/N: 1166
 Barometric Pressure (mm Hg) : 754.5
 Temperature (°C) : 32.4
 High Volume ID: RYG_FS0663
 High Volume Model: TE-5009X
 High Volume S/N: 6260
 Calibrator Slope: 1.51825
 Calibrator Intercept: -0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	1.0749	40	Slope : 33.9323 Intercept : 3.2104 Correlation Coefficient : 0.9973
2	3.4	1.2250	44	
3	4.2	1.3582	50	
4	5.2	1.5079	54	
5	6.4	1.6696	60	



Calibrated by : *Paruwat*
 (Mr. Panuwat Wanghong)
 RYG Field Services Scientist (1)

Approved by : *Supot*
 (Mr. Supot Salamteh)
 Field Services Section Head

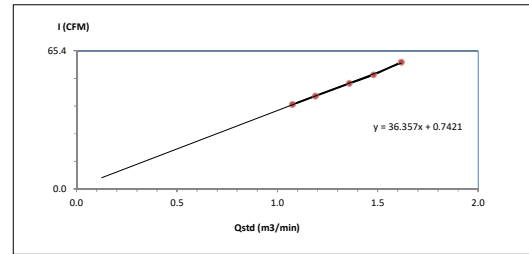
FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : WHA Eastern Seaboard Industrial Estate 4 Co., Ltd.
 Calibrate Location : หมู่ที่ 1 บ้านหนองน้ำขุ่น (A4)
 Calibrate Date : 24-Apr-26
 CalibrationSheet No.: C-240426-RYG_FS0396
 Calibrator ID: RYG_FS0205
 Calibrator Model: TE-5028A
 Calibrator S/N: 1166
 Barometric Pressure (mm Hg) : 754.5
 Temperature (°C) : 32.4
 High Volume ID: RYG_FS0396
 High Volume Model: TE-5170D
 High Volume S/N: 5688
 Calibrator Slope: 1.51825
 Calibrator Intercept: -0.02964

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	1.0749	40	Slope : 36.3573 Intercept : 0.7421 Correlation Coefficient : 0.9990
2	3.2	1.1893	44	
3	4.2	1.3582	50	
4	5.0	1.4792	54	
5	6.0	1.6175	60	



Calibrated by : *Paruwat*
 (Mr. Panuwat Wanghong)
 RYG Field Services Scientist (1)

Approved by : *Supot*
 (Mr. Supot Salamteh)
 Field Services Section Head

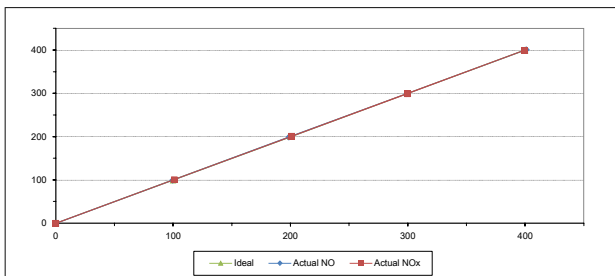
FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23



MULTIPOINT CALIBRATION REPORT

Calibration Date : 5-Jan-28
 Manufacturer : HORIBA
 Serial No. : H73KYD1M
 Calibrator Manufacturer : Teledyne API
 Serial No. : 947
 Std. Gas Concentration (PPM) : 55.88
 Cylinder Pressure (psi) : 1800
 Certified Date : 9-Feb-22
 Equipment Name : NOx Analyzer
 Model : APNA-370
 Equipment ID : BKK_FS0787
 Model : 700
 Cylinder No. : GN0027222
 Certified By : Airgas Inc.
 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	198.80	-1.20	-0.60	201.10	1.10	0.55
3	300.00	299.10	-0.90	-0.30	299.60	-0.40	-0.13
4	400.00	401.10	1.10	0.28	399.60	-0.40	-0.10
AVERAGE (%)				-0.16			0.28



Calibrated By : *Mr. Jirawat Sakam*
 (Mr. Jirawat Sakam)
 Field Environmental Scientist (3)

Approved By : *Mr. Sarayuth Jitranont*
 (Mr. Sarayuth Jitranont)
 Assistant General Manager

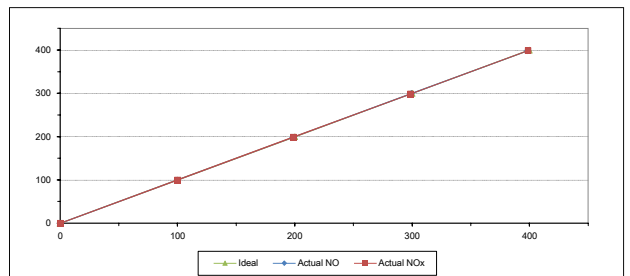
ALS Laboratory Group
 FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date : 5-Jan-28
 Manufacturer : Teledyne API
 Serial No. : 2197
 Calibrator Manufacturer : Teledyne API
 Serial No. : 947
 Std. Gas Concentration (PPM) : 55.88
 Cylinder Pressure (psi) : 1800
 Certified Date : 9-Feb-22
 Equipment Name : NOx Analyzer
 Model : T200
 Equipment ID : RYG_FS0285
 Model : 700
 Cylinder No. : GN0027222
 Certified By : Airgas Inc.
 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	198.10	-1.90	-0.95	198.80	-1.20	-0.60
3	300.00	299.40	-0.60	-0.20	298.70	-1.30	-0.43
4	400.00	398.40	-1.60	-0.40	398.90	-1.10	-0.28
AVERAGE (%)				-0.35			-0.22



Calibrated By : *Mr. Jirawat Sakam*
 (Mr. Jirawat Sakam)
 Field Environmental Scientist (3)

Approved By : *Mr. Sarayuth Jitranont*
 (Mr. Sarayuth Jitranont)
 Assistant General Manager

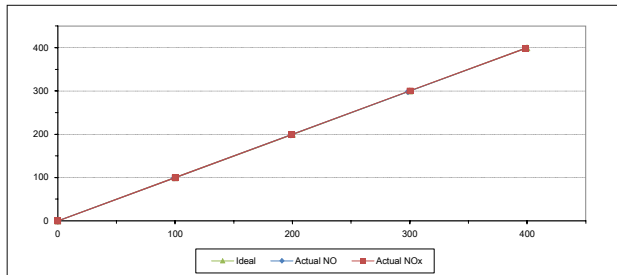
ALS Laboratory Group
 FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	7AV89544	Equipment ID	RYG_FS0272
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	99.10	-0.90	-0.90	100.10	0.10	0.10
2	200.00	198.70	-1.30	-0.65	199.50	-0.50	-0.25
3	300.00	298.60	-1.40	-0.47	300.30	0.30	0.10
4	400.00	398.90	-1.10	-0.28	398.70	-1.30	-0.33
AVERAGE (%)				-0.45			-0.06



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantong)
Assistant General Manager

ALS Laboratory Group

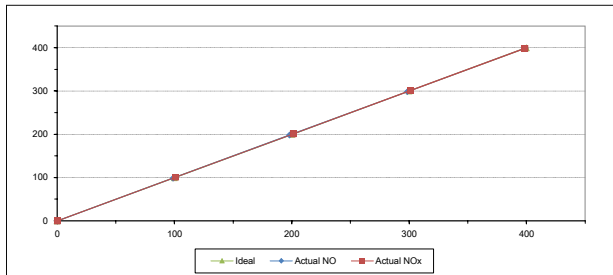
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	2198	Equipment ID	RYG_FS0282
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	98.80	-1.20	-1.20	101.00	1.00	1.00
2	200.00	198.20	-1.80	-0.90	201.20	1.20	0.60
3	300.00	298.60	-1.40	-0.47	301.00	1.00	0.33
4	400.00	398.90	-1.10	-0.28	398.70	-1.30	-0.33
AVERAGE (%)				-0.55			0.34



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantong)
Assistant General Manager

ALS Laboratory Group

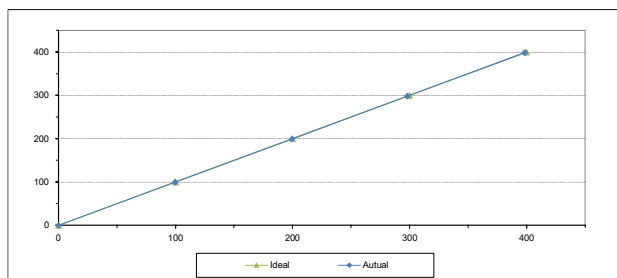
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	YPRXJ20	Equipment ID	RYG_FS0263
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	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	99.70	-0.30	-0.30
2	200.00	199.60	-0.40	-0.20
3	300.00	298.20	-1.80	-0.60
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.28



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantong)
Assistant General Manager

ALS Laboratory Group

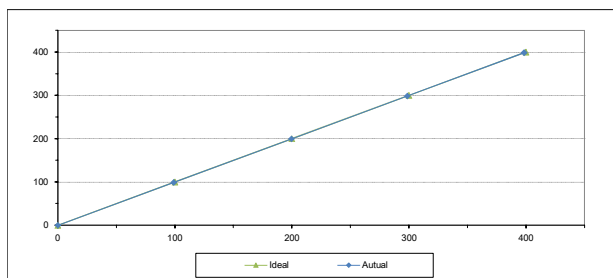
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	T100
Serial No.	1772	Equipment ID	RYG_FS0254
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	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	99.00	-1.00	-1.00
2	200.00	199.70	-0.30	-0.15
3	300.00	298.50	-1.50	-0.50
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.40



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantong)
Assistant General Manager

ALS Laboratory Group

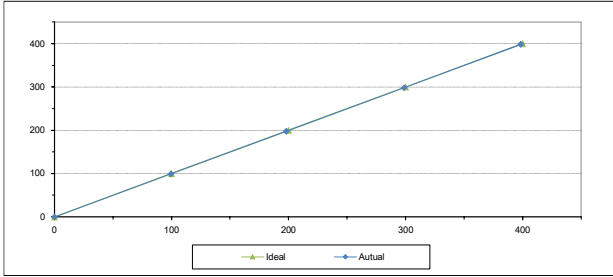
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	1092NYKM	Equipment ID	RYG_F80271
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	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	99.50	-0.50	-0.50
2	200.00	198.00	-2.00	-1.00
3	300.00	298.70	-1.30	-0.43
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.44



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantong)
Assistant General Manager

ALS Laboratory Group

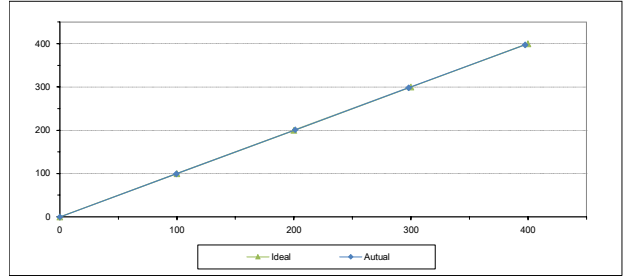
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	T100
Serial No.	1773	Equipment ID	RYG_F80251
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	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	99.60	-0.40	-0.40
2	200.00	201.10	1.10	0.55
3	300.00	298.10	-1.90	-0.63
4	400.00	397.50	-2.50	-0.63
AVERAGE (%)				-0.20



Calibrated By

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

Approved By

(Mr.Sarayuth Jittrantong)
Assistant General Manager

ALS Laboratory Group

FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



JIRANATEE ASSOCIATES CO.,LTD.
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Web site: www.jiranatee.com

Accredited calibration laboratory
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NSC-TIS 716-17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department.



NSC-TIS1-TIS 17025
CALIBRATION 0367

Certificate Number

CWS-002-68

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM	Cup anemometer
MANUFACTURER	Novolyne
MODEL/TYPE	Sensor: WS-02F Data logger: 200-WS-25DL
SERIAL NUMBER	Sensor: WSD-A4985 Data logger: A4985
ID NUMBER	RYG_F50085
CONDITION AS-RECEIVED	Used item
CUSTOMER	ALS Laboratory Group (Thailand) Co., Ltd. 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
RECEIVED DATE	10 Jan 2025
MEASUREMENT DATE	15 Jan 2025
ISSUE DATE	16 Jan 2025

ENVIRONMENTAL CONDITIONS:	
Ambient condition in the laboratory are as follow:	
Temperature	23.0 ± 3.0 °C
Relative Humidity	55.0 ± 15.0 %RH
Atmospheric Pressure	1010 ± 10 hPa

PLACE OF CALIBRATION: Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS	Wind tunnel cross-section area ¹	900 cm ²
	Wind direction frontal area ²	100 cm ²
	Diameter of mounting pipe ³	- mm
	Blockage ratio of test object ⁴	0.111 [-]

Preconditioning: 24 hours at ambient conditions.
Measurement Condition: The average values during measurement are (24.4) °C, (59.8) %RH and (1011.1) hPa.

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
[X] Mr. Sarawut Thongthad
[] Miss Jittrantong Lertsomphon

Approved signature:

Mr. Sarawut Thongthad
Calibration Department Manager

REVIEW BY:

APPROVED BY:

NEXT CAL DATE: 15/ 07/ 26

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

CWS-002-68

Page 2 of 2 Pages

MEASUREMENT RESULTS⁵

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 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 transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a round vertical tube of the gear plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{meas} (m/s)	Error (m/s)	U (k=2) (m/s)
0.986	24.50	24.40	0.9	-0.1	0.31
2.220	24.50	24.40	2.0	-0.2	0.31
3.010	24.40	24.40	3.0	0.0	0.45
4.224	24.42	24.40	4.0	-0.2	0.31
4.98	24.52	24.40	5.0	0.0	0.48
5.92	24.30	24.40	6.0	0.0	0.31
7.04	24.34	24.40	7.0	0.0	0.31
8.04	24.44	24.40	8.0	0.0	0.31
8.99	24.34	24.40	9.1	0.1	0.45
10.05	24.54	24.40	10.0	0.0	0.34
11.15	24.62	24.40	11.1	0.0	0.49
12.01	24.32	24.40	12.0	0.0	0.39
13.08	24.66	24.40	13.1	0.0	0.52
13.96	24.36	24.40	14.8	0.3	0.40
15.06	24.40	24.40	15.3	0.3	0.37
16.01	24.50	24.40	16.2	0.2	0.54

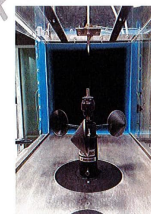
Remark:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Velocity of standard

³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.





JIRANATEE ASSOCIATES CO., LTD.

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Mobile: +66(0)8309453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Wind direction measurement laboratory
Calibration services department.



NSC-TISI-TIS 17025
CALIBRATION 0367

Certificate Number

CWD-021-69

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

: Wind Direction Sensor
: Novalltype
: Sensor: WS-02F
: Data logger: WS-25DL
: Sensor: WSD-A4562
: Data logger: A4562
: BKK_F50143
: Used item
: ALS laboratory group (Thailand) Co., Ltd.
: 104 Phattanasakun 40, Phattanasakun Rd,
: Khwaeng Suan Luang, Khet Suan Luang,
: Bangkok 10250 Thailand.

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

: 10 Feb 2026
: 23 Feb 2026
: 23 Feb 2026

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C

Relative Humidity : 55.0 ± 15.0 %RH

Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION

: Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION

: Wind tunnel cross-section area¹ 900 cm²
: Wind direction frontal area² 129 cm²
: Diameter of mounting pipe³ - mm
: Blockage ratio of test object⁴ 0.143 [-]

Preconditioning

Measurement Condition

: 24 hours at ambient conditions.
: The average values during measurement are (23.8)°C, (56.0) %RH and (1006.9) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio "to" ¹

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

CWD-021-69

Page 2 of 2 Pages

MEASUREMENT RESULTS⁵

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed	D ₁ use	D ₂ use	Error	U (k=2)
m/s	Degree (°)	Degree (°)	Degree (°)	Degree (°)
5.00	45.000	44	-1	0.60
	90.000	89	-1	0.60
	135.000	134	-1	0.60
	180.000	181	1	0.82
	225.000	228	3	0.82
	270.000	273	3	0.82
	315.000	317	2	0.82
	360.000	359	-1	0.60

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Direction of standard

⁷ Direction of Unit Under Calibration

End of Certificate of Calibration



JIRANATEE ASSOCIATES CO., LTD.

Jiranatee Associates Co., Ltd.
63/14-15, 67/35-36
Petchkasem 7/71, Rd. Wattapara, Bangkokkai,
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Tel: +66(0)830812
Mobile: +66(0)8309453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
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NSC-TISI-TIS 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department.



NSC-TISI-TIS 17025
CALIBRATION 0367

Certificate Number

CWS-018-69

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

: Cup anemometer
: Novalltype
: Sensor: WS-02F
: Data logger: 110-WS-25DL-D
: Sensor: WSD-A5660
: Data logger: A5660
: RYG_F50530
: Used item
: ALS laboratory group (Thailand) Co., Ltd.
: 104 Phattanasakun 40, Phattanasakun Rd,
: Khwaeng Suan Luang, Khet Suan Luang,
: Bangkok 10250 Thailand.

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

: 10 Feb 2026
: 20 Feb 2026
: 20 Feb 2026

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C

Relative Humidity : 55.0 ± 15.0 %RH

Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION

: Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

: Wind tunnel cross-section area¹ 900 cm²
: Cup anemometer frontal area² 100 cm²
: Diameter of mounting pipe³ - mm
: Blockage ratio of test object⁴ 0.111 [-]

Preconditioning

Measurement Condition

: 24 hours at ambient conditions.
: The average values during measurement are (23.6) °C, (54.9) %RH and (1008.2) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio "to" ¹

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

CWS-018-69

Page 2 of 2 Pages

MEASUREMENT RESULTS⁵

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 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 transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{std} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{std} (m/s)	Error (m/s)	U (k=2)
1.022	23.72	23.55	0.9	-0.1	0.31
2.180	23.46	23.55	2.0	-0.2	0.31
3.014	23.52	23.55	2.9	-0.1	0.31
4.212	23.54	23.55	4.0	-0.2	0.31
5.01	23.32	23.55	4.9	-0.1	0.31
6.01	23.52	23.55	6.0	0.0	0.31
7.01	23.26	23.55	7.0	0.0	0.31
8.00	23.40	23.55	8.0	0.0	0.31
9.01	23.30	23.55	9.1	0.1	0.31
10.00	23.32	23.55	10.1	0.1	0.31
11.00	23.42	23.55	11.1	0.1	0.31
11.98	23.40	23.55	12.2	0.2	0.31
12.99	23.50	23.55	13.2	0.2	0.31
13.97	23.50	23.55	14.3	0.3	0.32
14.99	23.50	23.55	15.4	0.4	0.34
16.03	23.54	23.55	16.4	0.4	0.32

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Velocity of standard

⁷ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO., LTD.

Jiranatee Associates Co., Ltd.
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CALIBRATION 0367



NSC-TIS-TIS 17025
CALIBRATION 0367

Wind direction measurement laboratory
Calibration services department.

Certificate Number

CWD-018-69

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

: Wind Direction Sensor

MANUFACTURER

: Novolyra

MODEL/TYPE

: Sensor: WS-02F

Data logger: 110-WS-25DL-D

SERIAL NUMBER

: Sensor: WSD-A5660

Data logger: AS660

ID NUMBER

: RWE_F50530

CONDITION AS-RECEIVED

: Used item

CUSTOMER

: ALS laboratory group (Thailand) Co., Ltd.
104 Phutthakanan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE

: 10 Feb 2026

MEASUREMENT DATE

: 20 Feb 2026

ISSUE DATE

: 20 Feb 2026

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

: 23.0 ± 3.0 °C

Relative Humidity

: 55.0 ± 15.0 %RH

Atmospheric Pressure

: 1010 ± 10 hPa

PLACE OF CALIBRATION

: Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION

: Wind tunnel cross-section area¹

900

cm²

Wind direction frontal area²

129

cm²

Diameter of mounting pipe³

-

mm

Blockage ratio of test object⁴

0.143

[-]

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are (23.7)°C, (59.3) %RH and (1007.5) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:

¹ Nozzle cross-section area of the wind tunnel

² Projected cross-section area of the tested object include mounting pipe

³ Diameter of mounting pipe

⁴ Ratio $\frac{A}{A_0}$

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



NSC-TIS-TIS 17025
CALIBRATION 0367

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TIS-TIS 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department.

Certificate Number

CWS-020-69

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

: Cup anemometer

MANUFACTURER

: Novolyra

MODEL/TYPE

: Sensor: WS-02F

Data logger: WS-25DL

SERIAL NUMBER

: Sensor: WSD-A4481

Data logger: A4481

ID NUMBER

: RWE_F50141

CONDITION AS-RECEIVED

: Used item

CUSTOMER

: ALS laboratory group (Thailand) Co., Ltd.
104 Phutthakanan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE

: 10 Feb 2026

MEASUREMENT DATE

: 23 Feb 2026

ISSUE DATE

: 23 Feb 2026

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

: 23.0 ± 3.0 °C

Relative Humidity

: 55.0 ± 15.0 %RH

Atmospheric Pressure

: 1010 ± 10 hPa

PLACE OF CALIBRATION

: Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

: Wind tunnel cross-section area¹

900

cm²

Cup anemometer frontal area²

100

cm²

Diameter of mounting pipe³

-

mm

Blockage ratio of test object⁴

0.111

[-]

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are (24.0) °C, (56.0) %RH and (1006.0) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

REVIEW BY

S.T.S

APPROVED BY

S.T.S

NEXT CAL DATE

22/08/2027

Remarks:

¹ Nozzle cross-section area of the wind tunnel

² Projected cross-section area of the tested object include mounting pipe

³ Diameter of mounting pipe

⁴ Ratio $\frac{A}{A_0}$

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

CWD-018-69

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D _{ref} Degree (°)	D _{me} Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.00	45.000	40	-5	0.60
	90.000	86	-4	0.60
	135.000	133	-2	0.95
	180.000	180	0	0.82
	225.000	228	3	0.60
	270.000	274	4	0.60
	315.000	319	4	0.60
	360.000	359	-1	0.60

Remark:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Direction of standard

³ Direction of Unit Under Calibration

End of Certificate of Calibration



Certificate Number

CWS-020-69

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The Cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 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 transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{me} (m/s)	Error (m/s)	U (k=2) (m/s)
1.031	23.86	23.95	0.9	-0.1	0.31
2.164	23.84	23.95	2.0	-0.2	0.31
3.001	23.90	23.95	2.9	-0.1	0.31
4.227	23.88	23.95	3.9	-0.3	0.31
5.03	23.70	23.95	5.0	0.0	0.31
6.02	23.90	23.95	5.9	-0.1	0.31
7.02	23.60	23.95	7.0	0.0	0.31
8.02	23.86	23.95	8.0	0.0	0.31
9.02	23.40	23.95	9.1	0.1	0.31
10.01	23.70	23.95	10.1	0.1	0.31
11.00	23.50	23.95	11.2	0.2	0.31
12.00	23.50	23.95	12.2	0.2	0.31
12.99	23.50	23.95	13.3	0.3	0.31
13.98	23.50	23.95	14.3	0.3	0.31
14.98	23.50	23.95	15.3	0.3	0.31
16.03	23.50	23.95	16.4	0.4	0.31

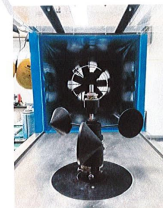
Remark:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Velocity of standard

³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.





JIRANATEE ASSOCIATES CO., LTD.

Jiranatee Associates Co., Ltd.
63/14-15, 67/35-36
Petchkasem 7/71 Rd. Watthapa, Bangkok,
Bangkok 10600 (Thailand)
Tel: +66(0)8080812
Mobile: +66(0)399453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TIS-TIS 17025
CALIBRATION 0367

Wind direction measurement laboratory
Calibration services department.



Certificate Number

CWD-020-69

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

: Wind Direction Sensor

MANUFACTURER

: Novolyne

MODEL/TYPE

: Sensor: WS-02F

Data logger: WS-25DL

SERIAL NUMBER

: Sensor: WSD-A4481

Data logger: A4481

ID NUMBER

: 00K_F00141

CONDITION AS-RECEIVED

: Used item

CUSTOMER

: AIS laboratory group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd.

Khuang Suan Luang, Khet Suan Luang,

Bangkok 10250 Thailand.

RECEIVED DATE

: 10 Feb 2026

MEASUREMENT DATE

: 23 Feb 2026

ISSUE DATE

: 23 Feb 2026

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

: 23.0 ± 3.0 °C

Relative Humidity

: 55.0 ± 15.0 %RH

Atmospheric Pressure

: 1010 ± 10 hPa

PLACE OF CALIBRATION

: Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION

: Wind tunnel cross-section area¹

900

cm²

Wind direction frontal area²

129

cm²

Diameter of mounting pipe³

-

mm

Blockage ratio of test object⁴

0.143

[-]

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are (23.6°C, (56.5) %RH and (1006.8) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad

☐ Miss Jittrapon Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:

¹ Nozzle cross section area of the wind tunnel

² Projected cross-section area of the tested object include mounting pipe

³ Diameter of mounting pipe

⁴ Ratio "to 1"

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



JIRANATEE ASSOCIATES CO., LTD.

Jiranatee Associates Co., Ltd.
63/14-15, 67/35-36
Petchkasem 7/71 Rd. Watthapa, Bangkok,
Bangkok 10600 (Thailand)
Tel: +66(0)8080812
Mobile: +66(0)399453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TIS-TIS 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department.



Certificate Number

CWS-014-68

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

: Cup anemometer

MANUFACTURER

: Novolyne

MODEL/TYPE

: Sensor: WS-02F

Data logger: WSD-25DL

SERIAL NUMBER

: Sensor: WSD-A5191

Data logger: A5191

ID NUMBER

: RYG_F50328

CONDITION AS-RECEIVED

: Used item

CUSTOMER

: AIS laboratory group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd, Khuang Suan Luang,

Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE

: 18 Apr 2025

MEASUREMENT DATE

: 08 May 2025

ISSUE DATE

: 09 May 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature

: 23.0 ± 3.0 °C

Relative Humidity

: 55.0 ± 15.0 %RH

Atmospheric Pressure

: 1010 ± 10 hPa

PLACE OF CALIBRATION

: Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

: Wind tunnel cross-section area¹

900

cm²

Cup anemometer frontal area²

100

cm²

Diameter of mounting pipe³

-

mm

Blockage ratio of test object⁴

0.111

[-]

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are (23.6) °C, (42.3) %RH and (1007.6) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad

☐ Miss Jittrapon Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

REVIEW BY:

S.T.S.

APPROVED BY:

S.T.H.

NEXT CAL DATE: 07/11/2026

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

CWD-020-69

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D _{rot} Degree (°)	D _{enc} Degree (°)	Error Degree (°)	U (k=2)	
				Degree (°)	
5.01	45.000	40	-5	0.60	
	90.000	87	-3	0.60	
	135.000	134	-1	0.60	
	180.000	182	2	0.60	
	225.000	230	5	0.60	
	270.000	276	6	0.60	
	315.000	320	5	0.60	
	360.000	359	-1	0.60	

Remarks:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Direction of standard

³ Direction of Unit Under Calibration

End of Certificate of Calibration



Certificate Number

CWS-014-68

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 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 transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{std} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{uuc} (m/s)	Error (m/s)	U (k=2) (m/s)
1.020	23.70	23.55	0.8	-0.2	0.31
2.262	23.42	23.55	2.0	-0.3	0.31
3.093	23.94	23.55	3.0	-0.1	0.31
4.258	23.90	23.55	3.9	-0.3	0.31
4.95	23.52	23.55	5.0	0.1	0.31
5.97	23.90	23.55	6.0	0.1	0.31
7.05	23.42	23.55	7.1	0.0	0.31
7.96	23.80	23.55	8.1	0.1	0.31
9.02	23.50	23.55	9.1	0.1	0.31
10.00	23.86	23.55	10.1	0.1	0.31
11.03	23.50	23.55	11.1	0.1	0.31
11.98	23.64	23.55	12.2	0.3	0.31
12.97	23.50	23.55	13.2	0.3	0.31
14.02	23.50	23.55	14.3	0.3	0.31
15.01	23.50	23.55	15.2	0.2	0.31
16.01	23.50	23.55	16.3	0.3	0.33

Remarks:

¹ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

² Velocity of standard

³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.



CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novolyne
MODEL/TYPE : Sensor: WS-02F
Data logger: 200-WS-25LB
SERIAL NUMBER : Sensor: WSD-AS191
Data logger: AS191
ID NUMBER : RYG_FS02F8
CONDITION AS RECEIVED : Used Item
CUSTOMER : AIS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

Calibration procedure:
The wind direction sensor was calibrated against Standard Rotary Encoder model AX4009TS DMA04-P3-S-00 in an open laboratory of Effel-type wind tunnel with 900 cm² cross section area. The WH-CL-008 based on IEC 61400-12-1, Wind energy generation systems, - Part 12-1: Power performance measurement of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:
This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: DA-0027-24.

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

RECEIVED DATE : 18 Apr 2025
MEASUREMENT DATE : 08 May 2025
ISSUE DATE : 09 May 2025

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follows:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION : Effel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION : Wind tunnel cross-section area¹ 900 cm²
Wind direction frontal area² 129 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.143 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.2)°C, (43.8) %RH and (1006.4) hPa.

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:
[] Mr. Sorawit Thakulad
[] Miss Jitratana Leelaporn



Approved signatory: Mr. Parinya Booncharoen
Calibration Department Manager

Remarks:
¹ Multiple cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio "a/b"

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

Page 2 of 2 Pages

MEASUREMENT RESULTS⁵

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed	D _{rot} ¹	D _{rot} ¹	Error	U (k=2)
m/s	Degree (°)	Degree (°)	Degree (°)	Degree (°)
45.000	40	40	-5	0.80
90.000	85	85	-5	0.80
135.000	130	130	-5	0.80
180.000	179	179	-1	0.80
225.000	228	228	3	0.80
270.000	274	274	4	0.80
315.000	319	319	4	0.80
360.000	359	359	-1	0.80

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

¹ Direction of standard

² Direction of Unit Under Calibration

End of Certificate of Calibration



SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/ Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand
Tel: +66 2433 8331 Email: calibration@sithiporn.com

SITHIPORN
associates



Cert. No. : ACC25058
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 : AIS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3.0) °C
Pressure : (101.3 ± 3.3) kPa
Relative Humidity : (50.0 ± 20.0) %

Received Date : 22 SEPTEMBER 2025
Calibration Date : 08 OCTOBER 2025
Date of Issue : 10 OCTOBER 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : Nitunon Srihawan
(Nitunon Srihawan)

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.

SITHIPORN associates

SITHIPORN ASSOCIATES CALIBRATION LABORATORY

Cert. No. : ACC25058
Job No. : VC68AC0188
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by follow 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	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	33461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26
Audio Analyzer	AVR-3360A	V744B6069	EF-0013-25	13-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACC25058
Job No. : VC68AC0188
Pages : 3 of 3

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

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

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.5	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.83	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

Cert. No. : ACL26087
Pages : 1 of 8

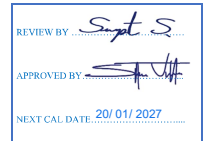
Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 01220938 / 21888 / 22327
ID No.: RYG_FS0629

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 05 JANUARY 2026
Calibration Date : 21 - 23 JANUARY 2026
Date of Issue : 26 JANUARY 2026



Calibrated by : Nathakorn Pisutpaisan

Approved by : (Nitinun Srihawan)

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.

Cert. No. : ACL26087
Job No. : VC69AC0053
Pages : 2 of 8

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
 - 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL26087
Job No. : VC69AC0053
Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL26087
Job No. : VC69AC0053
Page : 4 of 8

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

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	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 (dB)	Weighting (dB)
A - weight	9.9
C - weight	14.6
Flat	20.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	0.9	1.0	1.0	+ 1.5, - 2.5

CYSTM05

Cert. No. : ACL26087
Job No. : VC69AC0053
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.1	0.1	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.0	0.0	±0.8

CYSTM04

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Job No. : VC69AC0053
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	0.1	±1.0
125	0.0	0.1	0.0	±1.0
250	0.1	0.1	0.0	±1.0
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.1	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.1	+ 2.5, -16.0

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

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

5.2 Time weighting at 1 kHz

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

CYSTM05

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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.1	0.1	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.1	0.1	±0.5

CYSTM04

Cert. No. : ACL26087
Job No. : VC69AC0053
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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	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

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	±1.0
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.1	-0.3	±1.0

11. Overload indication

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

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

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250Certificate No : 24-SLM-329
Request No : Req-2024-2201

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Microphone Class : 1
Manufacturer : CIRRUS
Microphone Model : MK224
Model : CR171A
Microphone S/N : 217456A
Serial Number : G305028
Preamplifier Model : MV200F
ID : RYG_J50717
Preamp S/N : 13946F
Resolution : 0.1 dB
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 19 September 2024
Calibrated Date : 8 October 2024
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	Briel & Kjaer	4192	2294985	25 June 2025	NIMT
Audio Generator	Svante	Svan401	131	8 October 2024	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.Calibrated By : Mr. Noppadon Luangart
Service Calibration EngineerApproved By : Mr. Paet Mathavorn
Calibration Engineer Supervisor
Issue Date : 8 October 2024

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

FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-329
Request No : Req-2024-2201

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY	Acceptance Limit	Result
FAST / A / 20-140	(dB)	UUC	ERR	UUC	ERR	(± dB)	(± dB)	
Calibrator Setting								
1000 Hz 94 dB	93.77	94.0	0.23	93.8	±0.03	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140		(± dB)
UUC Weighting		
A	16.6	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140		(± dB)
UUC Weighting		
A	UR	0.10
C	14.6	0.10
Z	27.7	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit	Result
FAST / 20-140	A	C	Z	(± dB)	(± dB)	
STD Setting	(dB)	(dB)	(dB)			
125 Hz	0.3	0.1	0.1	0.60	1.0	Pass
1000 Hz	0.0	0.0	0.0	0.60	0.7	Pass
4000 Hz	-0.1	0.1	0.3	0.60	1.0	Pass
8000 Hz	0.3	0.5	0.7	0.70	+1.5 -2.5	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-329
Request No : Req-2024-2201

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit	Result
FAST / 20-140	A	C	Z	(± dB)	(± dB)	
STD Setting	(dB)	(dB)	(dB)			
63 Hz	0.3	0.1	0.2	0.20	1.0	Pass
125 Hz	0.3	0.1	0.1		1.0	Pass
250 Hz	0.3	0.1	0.0		1.0	Pass
500 Hz	0.2	0.1	0.0		1.0	Pass
1000 Hz	0.0	0.0	0.0		0.7	Pass
2000 Hz	-0.1	0.0	0.0		1.0	Pass
4000 Hz	-0.3	-0.1	0.0		1.0	Pass
8000 Hz	-0.5	-0.3	-0.1		+1.5, -2.5	Pass
16000 Hz	0.2	0.3	-0.3		+2.5, -16.0	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
FAST / 20-140	REF	UUC	ERR	(± dB)	(± dB)	
UUC Weighting	(dB)	(dB)	(dB)			
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0	0.20	0.20	Pass
Z	114.00	114.0	0.0	0.20	0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit	Result
20-140 / A	REF	UUC	ERR	(± dB)	(± dB)	
UUC Time Response	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0	0.10	0.10	Pass
Slow	114.00	114.0	0.0	0.10	0.10	Pass
Leq	114.00	114.0	0.0	0.10	0.10	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-329
Request No : Req-2024-2201

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 20-140	UUC		Limit	
STD Setting	(dB)	($\pm$ dB)	($\pm$ dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.10	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance	Result
FAST / A / 20-140	REF	UUC	ERR	Limit	
STD dB	(dB)	(dB)	(dB)	($\pm$ dB)	($\pm$ dB)
139.00	139	138.9	-0.1	0.8	Pass
134.00	134	134.0	0.0	0.8	Pass
129.00	129	129.0	0.0	0.8	Pass
124.00	124	124.0	0.0	0.8	Pass
119.00	119	119.0	0.0	0.8	Pass
114.00	114	114.0	0.0	0.8	Pass
109.00	109	109.0	0.0	0.8	Pass
104.00	104	104.0	0.0	0.8	Pass
99.00	99	99.0	0.0	0.8	Pass
94.00	94	94.0	0.0	0.8	Pass
89.00	89	89.1	0.1	0.8	Pass
84.00	84	84.1	0.1	0.8	Pass
79.00	79	79.1	0.1	0.8	Pass
74.00	74	74.1	0.1	0.8	Pass
69.00	69	69.1	0.1	0.8	Pass
64.00	64	64.1	0.1	0.8	Pass
59.00	59	59.1	0.1	0.8	Pass
54.00	54	54.1	0.1	0.8	Pass
49.00	49	49.1	0.1	0.8	Pass
44.00	44	44.1	0.1	0.8	Pass
39.00	39	39.1	0.1	0.8	Pass
34.00	34	34.1	0.1	0.8	Pass
29.00	29	29.1	0.1	0.8	Pass
24.00	24	24.1	0.1	0.8	Pass
23.00	23	23.1	0.1	0.8	Pass

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Certificate No : 24-SLM-329
Request No : Req-2024-2201

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance	Result
FAST / A	REF	UUC	ERR	Limit	
UUC Range	(dB)	(dB)	(dB)	($\pm$ dB)	($\pm$ dB)
20-140	28.90	29.1	0.2	0.8	Pass
	114	114.0	0.0	0.8	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance	Result
A / 20-140	Toneburst	Ref	UUC	ERR	Limit	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	($\pm$ dB)	($\pm$ dB)
Fast	200	136.0	136.0	0.0	0.5	Pass
	2	119.0	118.9	-0.1	+1.0, -1.5	Pass
	0.25	110.0	109.9	-0.1	+1.0, -3.0	Pass
Slow	200	129.6	129.6	0.0	0.5	Pass
	2	110.0	110.0	0.0	+1.0, -3.0	Pass
	200	130.0	130.0	0.0	0.5	Pass
SEL	2	110.0	110.0	0.0	+1.0, -1.5	Pass
	0.25	101.0	100.9	-0.1	+1.0, -3.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance	Result
FAST / C / 20-140	REF	UUC	ERR	Limit	
STD Setting	(dB)	(dB)	(dB)	($\pm$ dB)	($\pm$ dB)
Complete cycle	135.4	135.6	+0.20	2.0	Pass
Positive half cycle	134.4	134.3	-0.10	1.0	Pass
Negative half cycle	134.4	134.3	-0.10	1.0	Pass

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FM-708-SLM-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-329
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12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 20-140	UUC		Limit	
STD Setting	(dB)	($\pm$ dB)	($\pm$ dB)	
Positive one-half cycle	141.1			
Negative one-half cycle	141.1			
Deviated	0.0	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 20-140	UUC		Limit	
STD Setting	(dB)	($\pm$ dB)	($\pm$ dB)	
Initial	139.0			
Final	139.0			
Deviated	0.0	0.10	0.10	Pass

Note:

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at 4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

* Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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FM-708-SLM-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-329
Request No : Req-2024-2201

Decision Rule for Statements of Conformity

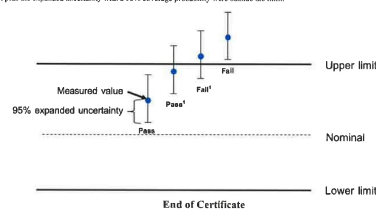
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass – The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ – The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ – The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail – The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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

FM-708-SLM-01 Rev.04 Issue date: 5/6/24

Cert. No. : ACL26086
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Calibration Certificate

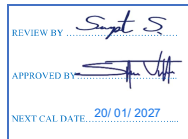
Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 01220937 / 21845 / 22326
ID No.: RYG_FS0628

Condition As Found : GOOD

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

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

Received Date : 05 JANUARY 2026
Calibration Date : 21 - 23 JANUARY 2026
Date of Issue : 26 JANUARY 2026



Calibrated by : Nathakorn Pisutpaisan

Approved by : Nitinun Srihawan
(Nitinun Srihawan)

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.

Cert. No. : ACL26086
Job No. : VC69AC0053
Pages : 2 of 8

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL-BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL-BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL26086
Job No. : VC69AC0053
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Summary of Measurement Result :

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

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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	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	Weighting (dB)
A - weight	9.9
C - weight	14.3
Flat	19.9

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	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	0.5	0.6	0.6	+ 1.5, - 2.5

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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	±1.0
125	0.0	0.1	0.1	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.1	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Mittrom S.

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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.0	0.0	±0.8

Mittrom S.

Cert. No. : ACL26086
Job No. : VC69AC0053
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.1	0.1	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

Mittrom S.

Cert. No. : ACL26086
Job No. : VC69AC0053
Pages : 8 of 8

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	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

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	±1.0
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.1	-0.3	±1.0

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	±0.1

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

Mittrom S.

Cert. No. : ACC25042
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No.: 34178124
ID No.: RYG_FS0216

Condition As Found : GOOD

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

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

Received Date : 04 AUGUST 2025
Calibration Date : 19 AUGUST 2025
Date of Issue : 20 AUGUST 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : *Wichok B.*
(Wichok Ekpongpradit)

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Cert. No. : ACC25042
Job No. : VC68AC0162
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by follow 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	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	33461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26
Audio Analyzer	AVR-3360A	V744B6069	EF-0013-25	13-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACC25042
Job No. : VC68AC0162
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.17	0.17	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.3	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
2.07	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

Cert. No. : ACL25287
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00531307 / 23456 / 32983
ID No.: NNG_FS0023

Condition As Found : GOOD

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

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

Received Date : 07 JULY 2025
Calibration Date : 21-23 JULY 2025
Date of Issue : 25 JULY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : *Wichok B.*
(Wichok Ekpongpradit)

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Cert. No. : ACL25287
Job No. : VC68AC0145
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).

3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25287
Job No. : VC68AC0145
Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL25287
Job No. : VC68AC0145
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Weighting (dB)
A - weight	8.7
C - weight	14.2
Flat	19.9

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	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	0.3	0.4	0.4	+ 1.5, - 2.5

Cert. No. : ACL25287
Job No. : VC68AC0145
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	-0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.0	0.0	+ 1.5, - 2.5
16000	0.0	-1.3	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Cert. No. : ACL25287
Job No. : VC68AC0145
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.1	0.1	±0.8
134.0	134.1	0.1	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.1	0.1	±0.8
114.0	114.1	0.1	±0.8
109.0	109.0	0.0	±0.8
104.0	104.1	0.1	±0.8
99.0	99.1	0.1	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	24.9	-0.1	±0.8

Cert. No. : ACL25287
Job No. : VC68AC0145
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±0.8

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	1.0 ; -3.0
	2	8	117.0	116.9	-0.1	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
	0.25	1	99.0	98.8	-0.2	1.0 ; -3.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

Cert. No. : ACL25287
Job No. : VC68AC0145
Pages : 8 of 8

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	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

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	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

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

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

Cert. No. : ACL25290
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No. : 00531311 / 23460 / 32987
ID No. : PHK_FS0032

Condition As Found : GOOD

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

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

Received Date : 07 JULY 2025
Calibration Date : 21-23 JULY 2025
Date of Issue : 25 JULY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : Wichon B.
(Wichon Ekpongpradit)

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Cert. No. : ACL25290
Job No. : VC68AC0146
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

microphone

Cert. No. : ACL25290
Job No. : VC68AC0146
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

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

Frequency Weighting	Weighting (dB)
A - weight	9.9
C - weight	15.0
Flat	20.6

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.3	0.3	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	0.7	0.8	0.8	+ 1.5, -2.5

microphone

Cert. No. : ACL25290
Job No. : VC68AC0146
Pages : 3 of 8

Summary of Measurement Result :

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

microphone

Cert. No. : ACL25290
Job No. : VC68AC0146
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	±1.0
125	0.0	0.1	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

microphone

Cert. No. : ACL25290
Job No. : VC68AC0146
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	83.9	-0.1	±0.8
79.0	78.9	-0.1	±0.8
74.0	73.9	-0.1	±0.8
69.0	68.9	-0.1	±0.8
64.0	63.9	-0.1	±0.8
59.0	58.9	-0.1	±0.8
54.0	53.9	-0.1	±0.8
49.0	48.9	-0.1	±0.8
44.0	43.9	-0.1	±0.8
39.0	38.9	-0.1	±0.8
34.0	33.9	-0.1	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

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Job No. : VC68AC0146
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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

Cert. No. : ACL25290
Job No. : VC68AC0146
Pages : 8 of 8

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	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

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	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.0	±1.5
89.5	89.5		

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	±0.1

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

End of Calibration Certificate

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY451-451/ Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email: calibration@sithiporn.comCert. No. : ACL25270
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00531293 / 23025 / 32969
ID No.: NKH_FS0129

Condition As Found : GOOD

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

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

Received Date : 03 JULY 2025
Calibration Date : 14-15 JULY 2025
Date of Issue : 16 JULY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : Wichok Ekpongpradit
(Wichok Ekpongpradit)

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.

Cert. No. : ACL25270
Job No. : VC68AC0143
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

prichan p.

Cert. No. : ACL25270
Job No. : VC68AC0143
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Weighting (dB)
A - weight	9.8
C - weight	14.8
Flat	20.4

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	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	0.4	0.5	0.4	+ 1.5, - 2.5

prichan p.

Cert. No. : ACL25270
Job No. : VC68AC0143
Pages : 3 of 8

Summary of Measurement Result :

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

prichan p.

Cert. No. : ACL25270
Job No. : VC68AC0143
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	±1.0
125	0.0	0.1	0.1	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

prichan p.

Cert. No. : ACL25270
Job No. : VC68AC0143
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	49.0	0.0	±0.8
44.0	43.9	-0.1	±0.8
39.0	38.9	-0.1	±0.8
34.0	33.9	-0.1	±0.8
30.0	30.0	0.0	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

Cert. No. : ACL25270
Job No. : VC68AC0143
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

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Job No. : VC68AC0143
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10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.3	-0.1	±2.0

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	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

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

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

Cert. No. : ACL25272
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00531295 / 23094 / 32971
ID No.: NKH_FS0131

Condition As Found : GOOD

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

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

Received Date : 03 JULY 2025
Calibration Date : 14-15 JULY 2025
Date of Issue : 16 JULY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : Wichok Ekpongpradit
(Wichok Ekpongpradit)

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>Wichok E.</i>
NEXT CAL DATE	14/07/26

Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL-BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL-BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

Michan B.

Cert. No. : ACL25272
Job No. : VC68AC0143
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

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

Frequency Weighting	Weighting (dB)
A - weight	8.7
C - weight	14.7
Flat	20.1

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	0.4	0.4	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	-0.1	0.0	-0.1	+ 1.5, -2.5

Michan B.

Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 3 of 8

Summary of Measurement Result :

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

Michan B.

Cert. No. : ACL25272
Job No. : VC68AC0143
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	-0.1	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.0	0.0	+ 1.5, - 2.5
16000	0.0	-1.3	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Michan B.

Cert. No. : ACL25272
Job No. : VC68AC0143
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.1	0.1	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.1	0.1	±0.8
114.0	114.1	0.1	±0.8
109.0	109.0	0.0	±0.8
104.0	104.1	0.1	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.0	0.0	±0.8

michon P.

Cert. No. : ACL25272
Job No. : VC68AC0143
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±0.8

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	1.0 ; -3.0
	2	8	117.0	116.9	-0.1	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	107.9	-0.1	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

michon P.

Cert. No. : ACL25272
Job No. : VC68AC0143
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

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	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

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

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

michon P.

Cert. No. : ACL25274
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preampifier NH-25
Serial No.: 00531297 / 23200 / 32973
ID No.: NKH_FS0133

Condition As Found : GOOD

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

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

Received Date : 03 JULY 2025
Calibration Date : 14-15 JULY 2025
Date of Issue : 16 JULY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(Wichok Ekpongpradit)

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.

Cert. No. : ACL25274
Job No. : VC68AC0143
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

rechan R.

Cert. No. : ACL25274
Job No. : VC68AC0143
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93,94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Weighting (dB)
A - weight	9.9
C - weight	14.8
Flat	20.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.0
1000	0.2	0.2	0.2	± 0.7
8000	-0.1	0.0	0.0	+ 1.5, - 2.5

rechan R.

Cert. No. : ACL25274
Job No. : VC68AC0143
Pages : 3 of 8

Summary of Measurement Result :

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

rechan R.

Cert. No. : ACL25274
Job No. : VC68AC0143
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	±1.0
125	0.0	0.1	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

rechan R.

Cert. No. : ACL25274
Job No. : VC68AC0143
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	83.9	-0.1	±0.8
79.0	78.9	-0.1	±0.8
74.0	74.0	0.0	±0.8
69.0	68.9	-0.1	±0.8
64.0	63.9	-0.1	±0.8
59.0	58.9	-0.1	±0.8
54.0	53.9	-0.1	±0.8
49.0	48.9	-0.1	±0.8
44.0	43.9	-0.1	±0.8
39.0	38.9	-0.1	±0.8
34.0	33.9	-0.1	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	28.0	0.0	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

nichon E.

Cert. No. : ACL25274
Job No. : VC68AC0143
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

nichon E.

Cert. No. : ACL25274
Job No. : VC68AC0143
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±1.0
Positive half cycle	135.4	135.3	-0.1	±1.0
Negative half cycle	135.4	135.3	-0.1	±1.0

11. Overload indication

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

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

nichon E.

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

451-451/ Sirinthon Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN
associates

Cert. No. : ACL25298
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00531302 / 23450 / 32978
ID No.: SRT_FS0020

Condition As Found : GOOD

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

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

Received Date : 14 JULY 2025
Calibration Date : 04 AUGUST 2025
Date of Issue : 06 AUGUST 2025

REVIEW BY	<i>Sut S</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL DATE	03/08/2026

Calibrated by : Nathakorn Pisutpaisan

Approved by : *Nichon E*
(Wichok Ekpongpradit)

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.

Cert. No. : ACL25298
Job No. : VC68AC0152
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).

3.3 Electrical And Electronics Institute (EEI).

prc/cha B.

Cert. No. : ACL25298
Job No. : VC68AC0152
Page : 4 of 8

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

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	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	Weighting (dB)
A - weight	10.8
C - weight	15.7
Flat	21.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.2	0.2	± 1.0
1000	0.1	0.1	0.1	± 0.7
8000	0.7	0.8	0.8	+ 1.5, - 2.5

prc/cha B.

Cert. No. : ACL25298
Job No. : VC68AC0152
Pages : 3 of 8

Summary of Measurement Result :

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

prc/cha B.

Cert. No. : ACL25298
Job No. : VC68AC0152
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	±1.0
125	0.0	0.1	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+2.5, -16.0

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

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

5.2 Time weighting at 1 kHz

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

prc/cha B.

Cert. No. : ACL25298
Job No. : VC68AC0152
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	132.9	-0.1	±0.8
132.0	131.9	-0.1	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	24.9	-0.1	±0.8

Nichon B.

Cert. No. : ACL25298
Job No. : VC68AC0152
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

Nichon R.

Cert. No. : ACL25298
Job No. : VC68AC0152
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.2	-0.2	±2.0

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	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.0	±1.5
89.5	89.5		

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	±0.1

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

Nichon B.

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

451-451/ Sirinthorn Road, Bangburum, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com



Cert. No. : ACL25300
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00531308 / 23457 / 32984
ID No.: NNG_FS0024

Condition As Found : GOOD

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

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

Received Date : 14 JULY 2025
Calibration Date : 04 AUGUST 2025
Date of Issue : 06 AUGUST 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : *Nichon B.*
(Wichok Ekpongpradit)

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.

Cert. No. : ACL25300
Job No. : VC68AC0153
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).

3.3 Electrical And Electronics Institute (EEI).

richan B.

Cert. No. : ACL25300
Job No. : VC68AC0153
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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Weighting (dB)
A - weight	8.7
C - weight	14.5
Flat	20.3

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.0
1000	0.1	0.1	0.1	± 0.7
8000	0.3	0.4	0.4	+ 1.5, - 2.5

richan B.

Cert. No. : ACL25300
Job No. : VC68AC0153
Pages : 3 of 8

Summary of Measurement Result :

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

richan B.

Cert. No. : ACL25300
Job No. : VC68AC0153
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	0.1	±1.0
125	0.0	0.1	0.1	±1.0
250	0.0	0.1	0.0	±1.0
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weightings	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.1

richan B.

Cert. No. : ACL25300
Job No. : VC68AC0153
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	27.0	0.0	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

nichol E

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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	130.0	130.0	0.0	±2.0
One	133.4	133.3	-0.1	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

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	±0.1

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

nichol E

Cert. No. : ACL25300
Job No. : VC68AC0153
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

nichol E

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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SITHIPORN
associates

Cert. No. : ACL25275
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00531298 / 23203 / 32974
ID No.: NKH_FS0134

Condition As Found : GOOD

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

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

Received Date : 03 JULY 2025
Calibration Date : 14-15 JULY 2025
Date of Issue : 16 JULY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : *Wichon E.*
(Wichon Ekpongpradit)

REVIEW BY *Nathakorn P.*
APPROVED BY *Wichon E.*
NEXT CAL DATE: 14/07/26

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.

Cert. No. : ACL25275
Job No. : VC68AC0143
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EELBP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EELBP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25275
Job No. : VC68AC0143
Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL25275
Job No. : VC68AC0143
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	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	Weighting (dB)
A - weight	11.6
C - weight	16.2
Flat	21.7

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.0
1000	0.3	0.3	0.3	± 0.7
8000	1.3	1.4	1.4	+ 1.5, - 2.5

Cert. No. : ACL25275
Job No. : VC68AC0143
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	-0.1	-0.1	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.0	0.0	+ 1.5, - 2.5
16000	-0.1	-1.3	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Cert. No. : ACL25275
Job No. : VC68AC0143
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.1	0.1	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.1	0.1	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	24.9	-0.1	±0.8

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Cert. No. : ACL25275
Job No. : VC68AC0143
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±0.8

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	1.0 ; -3.0
	2	8	117.0	116.9	-0.1	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	107.9	-0.1	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

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Cert. No. : ACL25275
Job No. : VC68AC0143
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

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	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.0	+1.5
89.5	89.5		

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	±0.1

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

michon 7

Cert. No. : ACL25277
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00531300 / 23231 / 32976
ID No.: NKH_FS0136

Condition As Found : GOOD

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

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

Received Date : 03 JULY 2025
Calibration Date : 14-15 JULY 2025
Date of Issue : 16 JULY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(Wichok Ekpongpradit)

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Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL_BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL_BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL25277
Job No. : VC68AC0143
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.4

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

Frequency Weighting	Weighting (dB)
A - weight	9.9
C - weight	15.2
Flat	20.8

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	0.3	0.4	0.4	± 1.0
1000	0.3	0.3	0.3	± 0.7
8000	0.0	0.1	0.1	+ 1.5, - 2.5

Cert. No. : ACL25277
Job No. : VC68AC0143
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	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.0	0.1	0.1	+ 1.5, - 2.5
16000	0.0	-1.2	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Cert. No. : ACL25277
Job No. : VC68AC0143
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	132.9	-0.1	±0.8
132.0	131.9	-0.1	±0.8
131.0	130.9	-0.1	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.0	0.0	±0.8

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Job No. : VC68AC0143
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.0	0.0	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.0	0.0	±0.5

Cert. No. : ACL25277
Job No. : VC68AC0143
Pages : 8 of 8

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	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

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	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

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

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

Cert. No. : ACL25276
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 00531299 / 23224 / 32975
ID No.: NKH_FS0135

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 : 03 JULY 2025
Calibration Date : 14-15 JULY 2025
Date of Issue : 16 JULY 2025

Calibrated by : Nathakorn Pisutpaisan

Approved by :

Wichok Ekpongpradit
(Wichok Ekpongpradit)

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.

Cert. No. : ACL25276
Job No. : VC68AC0143
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL.BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL.BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25276
Job No. : VC68AC0143
Pages : 3 of 8

Summary of Measurement Result :

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

Cert. No. : ACL25276
Job No. : VC68AC0143
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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

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

Frequency Weighting	Weighting (dB)
A - weight	9.9
C - weight	15.4
Flat	21.0

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	0.4	0.4	0.4	± 1.0
1000	0.3	0.3	0.3	± 0.7
8000	0.5	0.6	0.6	+ 1.5, - 2.5

Cert. No. : ACL25276
Job No. : VC68AC0143
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	-0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±1.0
4000	-0.1	0.0	0.0	±1.0
8000	0.0	0.0	0.0	+ 1.5, - 2.5
16000	-0.1	-1.3	-1.2	+ 2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Cert. No. : ACL25276
Job No. : VC68AC0143
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	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.0	0.0	±0.8

Cert. No. : ACL25276
Job No. : VC68AC0143
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)
130	94.0	94.0	0.0	±0.8

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±0.8

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	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.1	0.1	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
SEL	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.1	0.1	±0.5

Cert. No. : ACL25276
Job No. : VC68AC0143
Pages : 8 of 8

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
One	133.4	133.4	0.0	±2.0

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	±1.0
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

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

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



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR6000
Serial No. (or ID.): 1627845 (RYG_EN0037)
Manufacturer: HACH
Condition: In Condition
Certificate No.: C06250108
Issued Date: 18 March 2025
Job No.: WO-00064379
Page: 1 of 3

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

Environment Condition: Temperature 24.4 °C ± 0.3 °C
Humidity 60.8 %RH ± 3.5 %RH

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

Calibration By: Mr. Preecha Phoosai
Calibration Date: 18 March 2025
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 111583 and 111584
The standard for Photometric Certificate No. 9114984 and 111588
The standard for Stray light Certificate No. 111586 and 111585
The standard for Spectral resolution Certificate No. 111587

(Mr. Preecha Phoosai)
Person in charge

(Miss Kaewkan Suradech)
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 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).
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 Sakon Nakhon Road, Bangkok, Prachinburi, Prachinburi 10280
Phone: +66 2158 7000 Email: info@calibration@dksh.com Website: www.dksh.com/scientific-thailand

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Calibration Results:
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.61	418.5	0.11	0.13	
536.66	536.7	-0.04	0.13	
637.98	638.3	-0.32	0.13	
748.48	748.8	-0.32	0.13	
807.03	807.5	-0.47	0.13	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2930	0.291	0.0020	0.0045
	0.5168	0.518	-0.0012	0.0045
	1.0298	1.031	-0.0012	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2867	0.285	0.0017	0.0045
	0.5073	0.508	-0.0007	0.0045
	1.0083	1.009	-0.0007	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2516	0.250	0.0016	0.0045
	0.4595	0.461	-0.0015	0.0045
	0.9334	0.935	-0.0016	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2461	0.246	0.0001	0.0045
	0.4652	0.466	-0.0008	0.0045
	0.9468	0.948	-0.0012	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2594	0.259	0.0004	0.0045
	0.5040	0.505	-0.0010	0.0045
	1.0032	1.004	-0.0008	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2579	0.258	-0.0001	0.0045
	0.4971	0.497	0.0001	0.0045
	0.9720	0.973	-0.0010	0.0045

บริษัท ดีเคเอส อีซี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Prachinabong, Bangkok 10260
Phone: +66 2030 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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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
	0.7355	0.738	-0.0025	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8574	0.857	0.0004	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2864	0.290	-0.0036	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6374	0.637	0.0004	0.0080
Stray light *				
Standard: cut-off		UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.62 +/- 0.11 nm		260.6	1.7	1.770
391.44 +/- 0.11 nm		391.4	1.4	1.854
Spectral Resolution *				
Nominal Concentration 0.02 % w/v		Peak	Trough	Ratio
Standard Wavelength (nm)		268.65	266.69	1.38
UUC: Wavelength (nm)		268.2	266.2	
Std Absorbance (A)		0.4566	0.2780	
UUC: Absorbance (A)		0.413	0.299	

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

The End of Certificate

บริษัท ดีเคเอส อีซี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Prachinabong, Bangkok 10260
Phone: +66 2030 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C06-16: 11 Mar 2024

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00064379

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		ตรวจสอบ (ส่ง)		หมายเหตุ
18 Mar 2025	รายการตรวจเช็ค	18 Mar 2025		
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ	
General				
☒	☐	1. ความสมบูรณ์เครื่อง	☒	☐
☒	☐	2. ความสะอาด (ซ่องใส่ตัวอย่าง, ภายในนอกเครื่อง)	☒	☐
☒	☐	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	☒	☐
☒	☐	4. ปุ่มกด (Keypad)	☒	☐
☒	☐	5. หน้าจอ (Display, Screen Contrast)	☒	☐
Spectrophotometer				
☐	☐	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	☐	☐
☐	☐	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	☐	☐
☒	☐	8. ความยาวคลื่น (Wavelength Check)	☒	☐
☒	☐	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	☒	13.5 Hours
☒	☐	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	☒	893.0 Hours
☒	☐	11. ซ่องใส่ตัวอย่าง (Carousel Module)	☒	☐
pH Meter and Conductivity Meter				
☐	☐	12. อิเล็กโทรด (Electrode and Connection Cable)	☐	☐
☐	☐	13. ระดับสารละลายไอออน Electrode (Level KCl)	☐	☐
☐	☐	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	☐	☐
☐	☐	15. ขาจับอิเล็กโทรด (Stand)	☐	☐
Turbidimeter				
☐	☐	16. ค่าความขุ่นไม่มีตัวอย่าง (No Sample)	☐	☐
☐	☐	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นับ 3.0)	☐	☐
Automatic titrator				
☐	☐	18. สภาพ Piston Burettes	☐	☐
☐	☐	19. Function Rinsing and Dosing	☐	☐
☐	☐	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	☐	☐

เพิ่มเติมข้อแนะนำ: * 656.1nm = 656.1nm

* 486.0nm = 485.7nm

Mr.Preecha Phoosarsai
Service Engineer

บริษัท ดีเคเอส อีซี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Prachinabong, Bangkok 10260
Phone: +66 2030 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-R31-03: 20 Jul 2022



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TEL.0-2717-3000-29 FAX.0-2719-9484

**Certificate of Calibration**Cert. No.: 25LM10
Page.: 1 of 2

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 : 17 January 2025
Calibrated Date : 20 January 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lerngagrakul

Approved by :

() Chakrit Waewanjua
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 23 January 2025

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.

REVIEW BY	Photchana S.
APPROVED BY	
NEXT CAL DATE	20/07/26

Approved Signatory



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2501-0600DSC-2
Procedure Used :-

Cert. No.: 25LM10
Page.: 2 of 2

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	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	2411022	TPA	17 Sep 2025

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.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 15E100464

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor %
20.00	60	20.002	19.81	-0.192	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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Certificate of Testing

Cert.No.: 25TW15
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Received Date : 17 January 2025
Test Date : 20 January 2025
Reference : 2501-0600DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithean

Approved by :

Saithip
Approved Signatory

() Ponthippa Tameyakul
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 21 January 2025



Cert.No.: 25TW15
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 15E100464

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.20	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study
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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Certificate of Calibration

Cert. No.: 24TM1663
Page : 1 of 3

Equipment : Low Temp. Incubator
Manufacturer : Memmert
Model : IPP750
Serial No. : V818.0084
ID No. : RYG_EN0154
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
616/10 Moo 5, T.Maenam Khu,
A.Pluakdaeng,
Rayong 21140, Thailand
Location : BOD Room

Received Order : 01 November 2024
Calibration Date : 01 November 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Krisda Malee
Kunchit
Approved Signatory

Approved by :
() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 07 November 2024

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.



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1

Cert. No.: 24TM1663
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	24LM73	TPA	18 May 2025

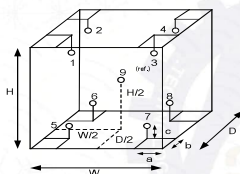
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certificate is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.72 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	55	53
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	23-01RTD-07
8	1RTD-2/8
9 (ref.)	23-01RTD-09



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1

Cert. No.: 24TM1663
Page : 3 of 3

Result of Calibration :-

(*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	20.0	0.026	0.26	0.53	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.071	19.915	20.273	20.179	19.977	19.782	20.056	20.026	20.033	0.30

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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Certificate of Calibration

Cert. No.: 24TM1663
Page : 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG_EN0154

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

Location : BOD Room

Received Order : 01 November 2024

Calibration Date : 01 November 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Krisda Malee

Approved by :
() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 07 November 2024

REVIEW BY : *Thanitak*
APPROVED BY : *Kunchit*
NEXT CAL DATE : 01/05/26



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-0002OC-1

Cert. No.: 24TM1663
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	24LM73	TPA	18 May 2025

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

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

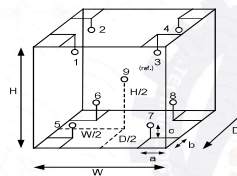
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	55	53
AC Supply (Volt)	220	221



Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.72 m³

Position :	Ref. Std. ID No.:
1	1RTD-2/1
2	1RTD-2/2
3	22-01RTD-03
4	1RTD-2/4
5	1RTD-2/5
6	1RTD-2/6
7	23-01RTD-07
8	1RTD-2/8
9 (ref.)	23-01RTD-09

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.



Equipment : Low Temp. Incubator
 Condition As-Received : Used Item
 Reference : 2411-0002OC-1
Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close

Cert. No.: 24TM1663
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	20.0	0.026	0.26	0.53	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.071	19.915	20.273	20.179	19.977	19.782	20.056	20.026	20.033	0.30

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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Certificate of Calibration

Cert. No.: 26TM461
 Page : 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG_EN0154

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

Location : BOD Room

Received Order : 18 March 2026

Calibration Date : 18 March 2026

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Preecha Hlahib

Approved by :

Approved Signatory

() Chakrit Waewwanjua

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 31 March 2026

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.



Equipment : Low Temp. Incubator
 Condition As-Received : New Item
 Reference : 2603-0502OC-2
Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	25LM121	TPA,	27 Jul 2026

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

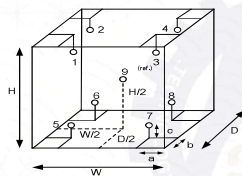
3. This measurement result is traceable to the International System of Unit maintained through :

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

a = 10 cm
 b = 10 cm
 c = 10 cm

Dimension of Chamber :

D = 0.60 m
 W = 1.0 m
 H = 1.2 m
 Capacity = 0.72 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	21
REL.Humid. (%)	37	33
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	23-16RTD-04
5	19-16RTD-05
6	19-14RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09

-o0o-



Equipment : Low Temp. Incubator
 Condition As-Received : New Item
 Reference : 2603-0502OC-2
Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 26TM461
 Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	20.0	0.019	0.19	0.34	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.185	20.132	20.303	20.160	20.001	20.054	19.983	20.060	20.163	0.30

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 %.



Certificate of Calibration

Cert.No.: 25CG3668
Page.: 1 of 2

Equipment : Burette
Capacity : 50 mL
Serial No. : -
ID, No. : RYG_EN0216
Manufacturer : Witeg
Made in : Germany
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5 T.MaenamKoo, A.Pluakdaeng
Rayong 21140, Thailand

Ambient Temperature : (20 ± 2.5) °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 753 mmHg
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Srisuda Khamtha

Approved by :
Approved Signatory

() Ponpan Paipim
(✓) Chakrit Waewwanjua

Issue Date : 19 September 2025

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.



Equipment : Burette
Received Date : 16 September 2025
Condition As-Received : Used Item
Calibration Date : 18 September 2025
Reference : 2509-0564DSC-3

Cert.No.: 25CG3668
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	XP205	B134206712	140RC007	25MM296	TPA	16 July 2026
2) Humidity/Baro/Temp	MHB-382SD	AM,42259	140EC016	25H1616	TPA	14 Aug 2026
3) Digital Thermometer	HH376	230806555	140EC013	25H1740	TPA	17 Jan 2026

This measurement result is traceable to 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 °C

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
10	10.0264	0.0082	2.00
25	25.0141	0.0087	2.00
50	49.9952	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 %.

-o0o-



Certificate of Calibration

Cert.No.: 25CH709/1
Page.: 1 of 3

This Certificate was issued to re place to the Certificate No.25CH709

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No. : B834291445
ID No. : RYG_EN0152
Condition As-Received : Used Item
Received Date : 12 June 2025
Calibration Date : 18 June 2025
Reference : 2506-0407DSC-2

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

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirithean

Approved by :
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 1 July 2025

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Cert.No.: 25CH709/1
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :The measurement results are traceable to SI through Hach Lenge GmbH Ltd.,
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
:The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 7.000	Hach Lenge GmbH	C03232	02 Dec 2026
pH 10.010	CPA chem	1066669	18 Jan 2026

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 Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			pH	mV		
pH Meter S/N: B834291445	4.000	177.48	177.3	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00



Cert.No.: 25CH709/1
Page.: 3 of 3

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 ($\pm$)	Coverage factor k
pH Electrode S/N.: 5211504	4.007 7.000 10.010	4.006 7.000 10.007	181.1 4.9 -170.6	0.0044 0.0084 0.0066	2.00 2.00 2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabEXpert Pro-ISM

- Serial No. : 5211504

Dimension of probe

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}$ C)	Standard Temperature ($^{\circ}$ C)	UUC* Reading ($^{\circ}$ C)	Error ($^{\circ}$ C)	Uncertainty of measurement ($\pm$ $^{\circ}$ C)	Coverage factor k
25.0	25.001	25.1	0.099	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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TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 25E1979/1
Page : 1 of 2

This Certificate was issued to replace to the Certificate No. 25E1979

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenExcellence
Serial No. : B834291445
ID No. : RYG_EN0152
Condition As-Received: Used Item
Received Date : 12 June 2025
Calibration Date : 16 June 2025

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.

Reference : 2506-0407DSC Submitted by : **ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch**

Ambient Temperature : (23 ± 2) $^{\circ}$ C

Relative Humidity : (50 ± 10) %

618/10 Moo 5, T.Maenam Khu, A.Pluaakdaeng, Rayong 21140, Thailand

Procedure used : Calibration were conducted using calibration procedure No. CP-E17 According to EURAMET cg-15.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6315011	25E1627	19 May 2026

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

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

4.This measurement result is traceable to the International System of Unit maintained through:-

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

Calibrated by : Wutcharaporn Peethong
Issue Date : 01 July 2025

Approved Signatory :
[] Phalinee Prabpaipal
[x] Nuntawat Khamchai
[] Pongsagorn Boonyaporn



Cert. No.: 25E1979/1
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)	($\pm$ μ V)	
-200.0000	-199.9	0.1	68	
-150.0000	-150.0	0.0	65	
-100.0000	-100.0	0.0	63	
-50.0000	-50.0	0.0	61	
0.0000	0.0	0.0	58	
50.0000	50.0	0.0	61	
100.0000	100.0	0.0	63	
150.0000	149.9	-0.1	65	
200.0000	199.9	-0.1	68	

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

UUC* = Unit Under Calibration.

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Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T252167

Certificate of Calibration

Page 1 of 4

Equipment : Chamber (Cold 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.Maenamkoo,

A.Pluaakdaeng, Rayong 21140

Customer Location : **ENVIRONMENT LABORATORY**

Date of Receipt : **19 November 2025**

Calibrated By : **Sujjar Naknakred (Site Calibration Manager)**

Approved By : **[Signature] / Boonchai Suriyawong (Site Calibration Manager)**

Date of Issue : **01 DEC 2025**



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.

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 27 November 2025
Environment : Temperature : 24.7-25.6 °C
Line Voltage : 222.3-226.3 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 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 2019) 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	TN161-TN170	T251760	17 October 2026
TC	TYPE T	TN171-TN180	T251760	17 October 2026
DATA LOGGER	34970A	T261	T251760	17 October 2026

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 $\frac{1}{2}$ Hour 12 Minute At 3 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

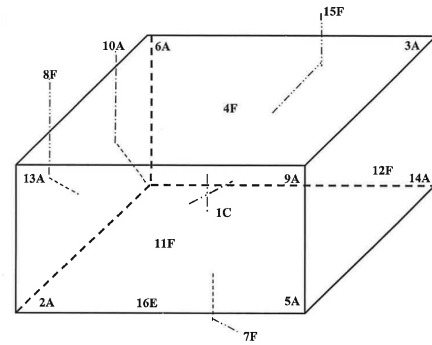
5. Adjustment :

() without adjustment (X) after adjustment

Approved By.

FM-TL07 102/27-03-68

Calibration Report



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

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

Approved By.

FM-TL07 102/27-03-68

Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)									
	1C TN161	2A TN162	3A TN163	4F TN164	5A TN165	6A TN166	7F TN167	8F TN168	9A TN169	10A TN170
3	2.59	2.80	2.94	2.86	3.05	3.44	3.11	3.30	3.29	3.66
	11F TN171	12F TN172	13A TN173	14A TN174	15F TN175	16E TN176				
	3.41	3.56	3.38	3.54	3.36	3.16				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability(±°C)	Uniformity(°C)	Uncertainty(±°C)	Coverage Factor k
	Min , Max	Average					
3.0	2.9 , 4.1	3.7	3.21	1.25	1.92	1.85	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 % .

End of Certificate.

Approved By.

FM-TL07 102/27-03-68



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Certificate of Testing

Cert.No.: 25TW193
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : Mettler Toledo
Model : Seven2GO S9
Serial No. : C231550471
ID No. : RYG_FS0603
Received Date : 19 September 2025
Test Date : 22 September 2025
Reference : 2509-0713DSC-3
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
616/10 Moo 5 T.MaenamKoo, A.Pluakdaeng,
Rayong 21140, Thailand

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithean

Approved by :
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Salthip Meangmai

Issue Date : 25 September 2025

REVIEW BY
APPROVED BY
NEXT CAL DATE.....22/09/26.....



Cert.No.: 25TW193
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This measurement result is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	ID No.	Certificate No.	Due Date
1. Burette	130BU10	25CG1126	18 Mar 2027
2. Balance	110RC001	25MM316	02 July 2026

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 939508

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8,20	8,21	0,0045

This report was certified only for the instrument we tested. It is **allowable** to use for study
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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Certificate of Calibration

Cert. No.: 25LM148
Page.: 1 of 2

Equipment : DO Meter with Sensor
Manufacturer : Mettler Toledo
Model : Seven2GO S9
Serial No. : C231550471
ID No. : RYG_FS0603
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5 T. Maenam Koo, A. Pluakdaeng,
Rayong 21140 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 19 September 2025
Calibrated Date : 28 September 2025
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Ruttanapachai

Approved by :
Approved Signatory

() Chakrit Waewwanjua
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 30 September 2025

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2509-0713DSC-4
Procedure Used :-
Cert. No.: 25LM148
Page.: 2 of 2

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	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	25I953	TPA	05 Sep 2026

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

3. This measurement result is traceable to the International System of Unit maintained through :

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (°) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N: 939508

Calibration Point (° C)	Immersion Depth (mm)	Standard Temperature (° C)	UUC* Reading (° C)	Error (° C)	Uncertainty (± ° C)	Coverage Factor k
20,0	80	20,006	20,1	0,094	0,16	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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TEL 0-2717-3000-29 FAX 0-2719-9484



Certificate of Calibration

Cert.No.: 25CH45
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C129171496
ID No. : RYG_FS0550
Condition As-Received: Used Item
Received Date : 17 July 2025
Calibration Date : 18 July 2025
Reference : 2507-0561DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Rayong Branch
616/10 Moo 5, T. Maenam Khu,
A. Pluakdaeng, Rayong 21140, Thailand
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure :
In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirithean

Approved by :
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Salthip Meangmai

Issue Date : 21 July 2025

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Cert.No.: 25CH845
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	3240076	60RC033	25I394	01 Apr 2026

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1114385	08 June 2026

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 Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement ($\pm$ mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: C129171496	4.00	177.48	177	4.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00



Cert.No.: 25CH845
Page: 3 of 3

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 ($\pm$)	Coverage factor k
pH Electrode S/N.: 4270655	4.007	4.02	167	0.0079	2.00
	6.965	6.97	-7	0.0099	2.00
	10.010	10.01	-180	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Go-ISM
- Serial No. : 4270655
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 ($\pm$ °C)	Coverage factor k
25.0	25.000	25.0	0.000	0.13	2.00
45.0	45.002	45.0	-0.002	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 %.

-00-



Certificate of Calibration

Equipment: CONDUCTIVITY METER
Manufacturer: Thermo Scientific
Model: Orion STAR A215
Serial No.: X58821
ID No.: RYG-EN0200
Condition of the item: Normal

Certificate No.: C24250274
Job No.: WO-00096654
Issued Date: 3 December 2025
Page: 1 of 2

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

Environment Condition: Temperature 21.8 °C $\pm$ 0.5 °C
Relative Humidity 50.5 % $\pm$ 1.8 %

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

Calibration By: Mr.Nattapat Rungueang
Calibration Date: 1 December 2025
The Method Used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14
Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 1100180, 1135990, 1100182, 1066609

Signature

(Mr. Nattapat Rungueang)
Person in charge

REVIEW BY Pholchanna S.
APPROVED BY [Signature]
NEXT CAL. DATE 11/12/26

Signature
(Mr. Udon Srichana)
Authorized signatory

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

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM: 1995).

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.

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CAL-FM-C24-10: 30 Jun 2025



Certificate No.: C24250274 Page: 2 of 2

Calibration Results:

Manufacturer: Thermo Scientific Model: ORION 013005MD Electrode Serial No.: YQ1-11982

Before Adjustment

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty ($\pm$)
25.000 μ S/cm	27.29 μ S/cm	-2.290 μ S/cm	2.00	0.28 μ S/cm
84.047 μ S/cm	88.25 μ S/cm	-4.203 μ S/cm	2.00	0.68 μ S/cm
1413.5 μ S/cm	1444 μ S/cm	-30.5 μ S/cm	2.00	11 μ S/cm
12.881 mS/cm	13.26 mS/cm	-0.379 mS/cm	2.00	0.098 mS/cm

After Adjustment : at 25.000 μ S/cm, 84.047 μ S/cm, 1413.5 μ S/cm, 12.881 mS/cm

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty ($\pm$)
25.000 μ S/cm	25.03 μ S/cm	-0.030 μ S/cm	2.00	0.28 μ S/cm
84.047 μ S/cm	84.06 μ S/cm	-0.013 μ S/cm	2.00	0.68 μ S/cm
1413.5 μ S/cm	1413 μ S/cm	0.5 μ S/cm	2.00	11 μ S/cm
12.881 mS/cm	12.89 mS/cm	-0.009 mS/cm	2.00	0.098 mS/cm

The End of Certificate

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CAL-FM-C24-10: 30 Jun 2025



Checklist for Conductivity Meter

Worksheet number: WO-00096654

Instrument type: Conductivity Meter

Model: Orion STAR A215

S/N: X58821

Check (receive)		Checklist	Check (send)		Note
01 Dec 2025			01 Dec 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Switch	☒	☐	
☒	☐	4. Keypad	☒	☐	
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Electrode and Connection Cable	☒	☐	
☐	☐	7. Electrode (Dust Protection Hood)	☐	☐	-
☒	☐	8. Stand	☒	☐	

Recommend :

Mr.Nattapat Rungruang
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ซอยสุขุมวิท 102/6 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2036 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-R53-00: 8 Apr 2025



Certificate of Calibration

Equipment : Digital Thermometer with Probe
Manufacturer: Thermo Scientific
Model: Orion STAR A215
Serial No.: X58821
ID No.: RYG-EN0200
Condition of the item: Normal

Certificate No. : C15251274
Job No. : WO-00096654
Issued Date : 04 December 2025
Page: 1 of 2

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

Environment Condition : Temperature: 30 °C ± 10 °C
Relative Humidity: 55 % ± 25 %
Voltage: 220 VAC ± 10 %

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

Calibration By : Mr. Nattapat Rungruang

Calibration Date : 01 December 2025

The Method Used : In house method, CAL-WI-69, by comparison with standard thermometer

Traceability : This certificate is traceable to the International System of Unit maintained by:
Quality Reborn Co.,Ltd. (QR)



(Mr. Nattapat Rungruang)
Person in charge

(Mr. Tweewong Thaitiang)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).
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.

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Phone: +66 2036 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C15-15: 30 Jun 2025



Certificate No.: C15251274

Page: 2 of 2

Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR25-2474	11 August 2025	11 August 2026

Calibration Results:

Without Adjustment

Sensor Type: RTD Electrode Serial No. YQ1-11982 Channel: -
Diameter (mm): 15 Length (mm): 120 Immersion (mm): 110

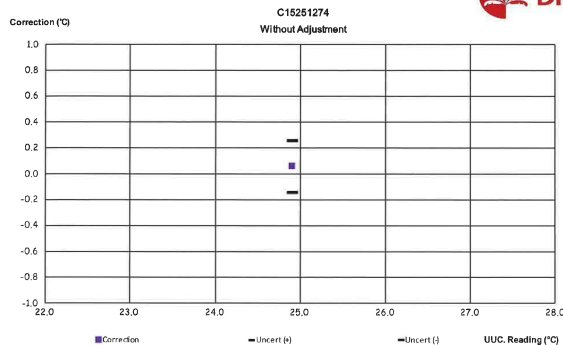
Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.960	24.9	0.060	0.20

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ซอยสุขุมวิท 102/6 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2036 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C15-15: 30 Jun 2025



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ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ (Digital Thermometer Checklist)

Equipment : Digital Thermometer with Probe
Serial No. : X58821

Certificate No. : C15251274
Model : Orion STAR A215

Check Date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
1-Dec-2025			1-Dec-2025		
Normal	Defective		Normal	Defective	
		General			
☒	☐	1. สายไฟ (Electric wire)	☒	☐	
☒	☐	2. Adaptor / Power supply 220 / 110 VAC	☒	☐	
☒	☐	3. การทำงาน (On/Off Switch)	☒	☐	
☒	☐	4. การทำงาน (Selector Key)	☒	☐	
☒	☐	5. หน้าจอแสดงผล (Display)	☒	☐	
☐	☐	6. แบตเตอรี่ (Battery)	☐	☐	ไม่มี
☒	☐	7. สภาพตัวเครื่อง (Equipment Body)	☒	☐	
☒	☐	8. หัววัดเซ็นเซอร์ (Sensor (In / Ex))	☒	☐	

Note :

Mr. Nattapat Rungruang
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
253 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10260
2533 Sukhumvit Road, Bangkok, Phraeklong, Bangkok 10260
Phone: +66 206 7900 Email: info@calibration@dksh.com Website: www.dksh.com/thailand

Delivering Growth - in Asia and Beyond.

SARTORIUS



Accredited by

NSC-TIS-TIS 17025
Calibration 0426

Calibration certificate

Calibration Certificate No. 25BK0003

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSU224S-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP W108.
Serial QM Ident. no.	31709552 RYG_EN0003	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
	616/10 Moo 5 T.Maenam Khu. A,Pluak Daeng, Rayong 21140, Thailand.	
Order no.	2230	
Number of pages	4	
Date of calibration	20 Feb 2025	

REVIEW BY *Thanitak*

APPROVED BY *D. Kachen*

NEXT CAL DATE... 20/02/26

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TIS-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date	06 Mar 2025	Approval of the Calibration Certificate	Person in charge
		<i>Chonchai Inthana</i>	<i>Kachen Lalee</i>
		Mr. Chonchai Inthana	Kachen Lalee

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129 Rama 9 Road, Huaykwang
10310 Bangkok

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Calibration certificate No. 25BK0003
Calibration Certificate

Calibration object

Single range instrument

Model	MSU224S-100-DU
Serial Number	31709552
QM Ident. no Inventory no.	RYG_EN0003 —
Maximum capacity (Max. load)	220,000 g
Measured range	220,000 g
Scale interval	0,0001 g

Place of calibration

Address	According to page 1
Department Cost center	Laboratory Department. —
Building Floor	— 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-362SD s/nB011342 Traceable to SI unit through DKSH	21 Aug 2025
Test weight set OIML R111 E2	Certificate No.M2308197S.E2(Traceable to SI unit through TCS)	23 Aug 2025

Calibration certificate No. 25BK0003
Calibration Certificate

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	20 Feb 2025
Temperature at place of calibration Temp. diff.	24,7 °C 0,3 K
Weights - T _{place}	
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 62,3 %RH.

Measurement results | Measurement uncertainties

Repeatability			Eccentricity		
Test load (nominal): 10 g 200 g			Test load (nominal): 100 g		
	10 g	200 g			
1	10,0000 g	200,0000 g	Center	100,0000 g	1,2 %
2	10,0000 g	200,0001 g	Front left	100,0000 g	
3	9,9999 g	200,0000 g	Back left	100,0001 g	
4	10,0000 g	200,0000 g	Back right	99,9999 g	
5	10,0000 g	200,0001 g	Front right	99,9999 g	
6	9,9999 g	200,0000 g	Maximum deviation from centric loading indication		
7	10,0000 g	200,0000 g	Δ _{ecc} _{max} = 0,0001 g		
8	10,0000 g	200,0000 g			
9	10,0000 g	200,0000 g			
10	10,0000 g	200,0001 g			
s = 0,00004 g s = 0,00005 g					

Test load	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
L	I	E	K	U(E)	U _{rel} (E)
0,0100 g	0,0100 g	0,0000 g	2,00	0,00012 g	1,2 %
0,1000 g	0,1000 g	0,0000 g	2,00	0,00013 g	0,13 %
0,5000 g	0,5000 g	0,0000 g	2,00	0,00013 g	0,026 %
1,0000 g	1,0000 g	0,0000 g	2,00	0,00013 g	0,013 %
5,0000 g	5,0000 g	0,0000 g	2,00	0,00013 g	0,0026 %
10,0000 g	10,0000 g	0,0000 g	2,00	0,00013 g	0,0013 %
20,0000 g	20,0000 g	0,0000 g	2,00	0,00014 g	0,0008 %
50,0000 g	50,0000 g	0,0000 g	2,00	0,00015 g	0,00029 %
100,0000 g	100,0001 g	0,0001 g	2,00	0,00018 g	0,00018 %
200,0000 g	200,0000 g	0,0000 g	2,00	0,00028 g	0,00014 %
220,0000 g	220,0000 g	0,0000 g	2,00	0,00032 g	0,00015 %
Maximum error of indication		E _{max} = 0,0001 g			

U_{rel}(E) is the quotient of U(E) and test load L. The uncertainty of measurement U(E) is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under Appendix to the calibration certificate | Interpretation of measurement results.

Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

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Uncertainty of measurement in use

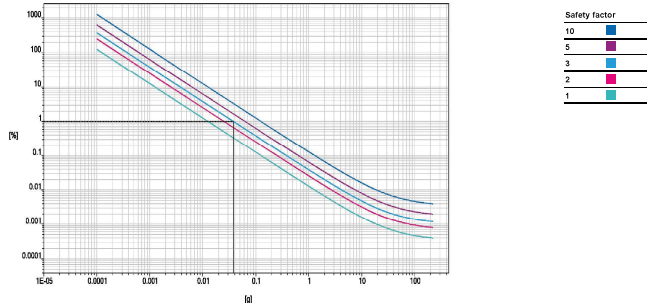
Device adjusted before measurement	Yes
Temperature deviation considered	1,5 K (isoCAL active)
Temperature coefficient considered	$1 \cdot 10^{-4}/K$

Uncertainty of the weighing result $U_{g(W)}$ $U_{g(W)} = 0,00013 \text{ g} + 3,42 \cdot 10^{-4} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{g(W)}$	Uncertainty relative $U_{g(W)rel}$
1 %	2,0000 g	0,00014 g	0,0063 %
25 %	55,0000 g	0,00032 g	0,00058 %
50 %	110,0000 g	0,00051 g	0,00046 %
75 %	165,0000 g	0,00069 g	0,00042 %
100 %	220,0000 g	0,00088 g	0,00040 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1,00 %
Safety factor	3
Minimum sample weight	0,0380 g

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Accredited by

NSC-TIS-TIS 17025
Calibration 0426

Calibration certificate

Calibration Certificate No. 26BCI0066

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	MSU224S-100-DU	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI08.
Serial QM Ident. no.	31709552 RYG_EN0003	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
Order no.	278579	
Number of pages	4	
Date of calibration	03 Feb 2026	

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TIS-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date of issue	03 Feb 2026	Approval of the Calibration Certificate	Person in charge
		Mr. Chonchai Inthana	Chonchai Inthana

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129 Rama 9 Road, Huaykwang
10310 Bangkok

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Calibration certificate No. 26BCI0066
Calibration Certificate

Calibration object

Single range instrument

Model	MSU224S-100-DU
Serial Number	31709552
QM Ident. no Inventory no.	RYG_EN0003 —
Maximum capacity (Max. load)	220,0000 g
Measured up to	220,0000 g
Scale interval	0,0001 g

Place of calibration

Address	According to page 1
Department Cost center	Laboratory Department. —
Building Floor	— 1st Floor.
Room	Balance Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET Calibration Guide No. 18, Version 4.0 (11/2015) - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	Testo 174H H/T250743 (Traceable to Si unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M2508149S_E2(Traceable to SI unit through TCS)	19 Aug 2027

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Calibration certificate No. 26BCI0066
Calibration Certificate

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	03 Feb 2026
Temperature at place of calibration Temp. diff.	24,5 °C 0,5 K
Weights - T_{place}	
Measuring conditions	The installation site is suitable. The device is level. Balance was loaded up to Max before test.
Comments	Humidity 52,0 %RH.

Measurement results | Measurement uncertainties

Repeatability	Eccentricity
Test load (nominal): 10 g 200 g	Test load (nominal): 100 g
10 g 200 g	Center 100,0000 g
1 10,0000 g 200,0000 g	Front left 100,0000 g
2 10,0000 g 200,0001 g	Back left 99,9999 g
3 10,0000 g 200,0001 g	Back right 100,0000 g
4 10,0001 g 200,0001 g	Front right 100,0000 g
5 10,0000 g 200,0001 g	Maximum deviation from centric loading indication
6 10,0000 g 200,0000 g	$ M_{ecc} _{max} = 0,0001 \text{ g}$
7 10,0000 g 200,0000 g	
8 10,0000 g 200,0000 g	
9 10,0000 g 200,0000 g	
10 10,0000 g 200,0000 g	
$s = 0,00003 \text{ g}$ $s = 0,00005 \text{ g}$	

Test load	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
0,0100 g	0,0100 g	0,0000 g	2,00	0,00010 g	1,0 %
0,1000 g	0,1000 g	0,0000 g	2,00	0,00013 g	0,13 %
0,5000 g	0,5000 g	0,0000 g	2,00	0,00013 g	0,027 %
1,0000 g	1,0000 g	0,0000 g	2,00	0,00013 g	0,013 %
5,0000 g	5,0000 g	0,0000 g	2,00	0,00014 g	0,0027 %
10,0000 g	10,0000 g	0,0000 g	2,00	0,00014 g	0,0014 %
20,0000 g	20,0000 g	0,0000 g	2,00	0,00014 g	0,00071 %
50,0000 g	50,0001 g	0,0001 g	2,00	0,00015 g	0,00030 %
100,0000 g	100,0000 g	0,0000 g	2,00	0,00018 g	0,00018 %
200,0000 g	200,0000 g	0,0000 g	2,00	0,00028 g	0,00014 %
220,0000 g	220,0000 g	0,0000 g	2,00	0,00032 g	0,00015 %
Maximum error of indication		$ E _{max} = 0,0001 \text{ g}$			

$U_{g(E)}$ is the quotient of $U(E)$ and test load L . The uncertainty of measurement $U(E)$ is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.

Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

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10310 Bangkok

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Uncertainty of measurement in use

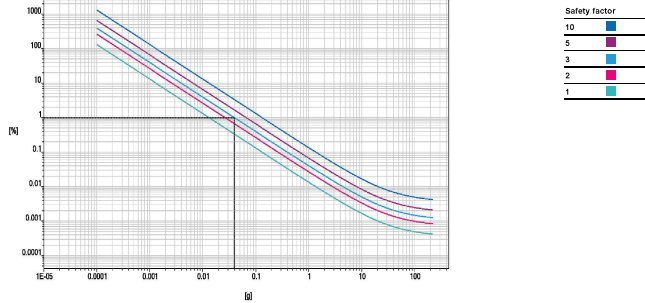
Device adjusted before measurement Yes
 Temperature deviation considered 1,5 K (isoCAL active)
 Temperature coefficient considered $1 \cdot 10^{-4}/K$

Uncertainty of the weighing result $U_{95}(W)$ $U_{95}(W) = 0.00013 \text{ g} + 3.65 \cdot 10^{-4} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty multiplied with an expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET-cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{95}(W)$	Uncertainty relative $U_{95}(W)/R$
1 %	2,2000 g	0,00014 g	0,0063 %
25 %	55,0000 g	0,00033 g	0,00060 %
50 %	110,0000 g	0,00053 g	0,00048 %
75 %	165,0000 g	0,00073 g	0,00044 %
100 %	220,0000 g	0,00093 g	0,00042 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy 1,00 %
 Safety factor 3
 Minimum sample weight 0.0395 g

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 129 Rama 9 Road, Huaykwang
 10310 Bangkok

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Page 4 | 4



Metrology Center
SCI ECO Services Company Limited
 51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
 Bangkok Tel : +668 9205 6851 , +669 81924 0059
 Saraburi Tel : +669 8247 2360
 Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T252169

Certificate of Calibration

Page 1 of 3

Equipment : Liquid Bath (Water)

Manufacturer : Memmert

Model : WNE29

Serial No. : L623.0105

Customer Code : RYG_EN0220

ID No. : T5650A5

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

616/10 Moo 5 T.Maenamkoo,

A.Pluakdaeng, Rayong 21140

Customer Location : Wet Chemistry Lab

Date of Receipt : 19 November 2025

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

Approved By : *[Signature]* / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 01 DEC 2025



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-TL06 102/27-03-68



Metrology Center
SCI ECO Services Company Limited
 51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



Certificate No. T252169

Calibration Report

Page 2 of 3

Equipment : Liquid Bath (Water)
 Date of Calibration : 27 November 2025
 Environment : Temperature : 25.5-25.7 °C
 Line Voltage : 221.8-225.5 V
 Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 (based on ASTM E715-80 (Reapproved 2022)).
 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
RTD	100 OHM	M18 (CH1-CH5)	T251758	17 October 2026
DATA LOGGER	34970A	T261	T251758	17 October 2026

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 3 Minute At 63 °C

5. Adjustment :

(X) without adjustment () after adjustment

Approved By. *[Signature]*

FM-TL07 102/27-03-68



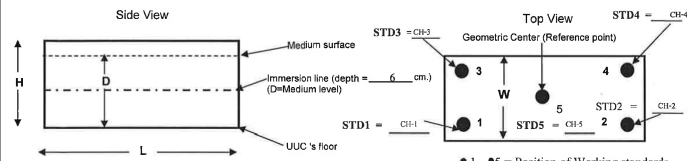
Metrology Center
SCI ECO Services Company Limited
 51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



Certificate No. T252169

Calibration Report

Page 3 of 3



- D = Medium level : 12 cm.
 - UUC 's medium : Water
 - Working standards are located at 2.5 cm. away from each corner and walls.

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)				
	CH-1	CH-2	CH-3	CH-4	CH-5
63	62.93	63.13	62.94	63.10	63.09
85	85.15	85.33	85.21	85.43	85.20

Liquid Bath (Water)			Temperature Distribution			
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)
	Min , Max	Average				
63.0	62.9, 63.1	63.0	63.04	0.08	0.17	0.27
85.0	84.8, 85.2	85.0	85.26	0.13	0.24	0.43
						Coverage Factor k
						2.06
						2.23

* 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 % .

End of Certificate.

Approved By. *[Signature]*

FM-TL07 102/27-03-68



Certificate of Calibration



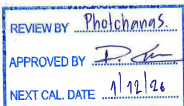
Equipment: CONDUCTIVITY METER Certificate No.: C24250274
Manufacturer: Thermo Scientific Job No.: WO-00096654
Model: Orion STAR A215 Issued Date: 3 December 2025
Serial No.: X58821 Page: 1 of 2
ID No.: RYG-EN0200
Condition of the item: Normal

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

Environment Condition: Temperature 21.8 °C ± 0.5 °C
Relative Humidity 50.5 % ± 1.8 %

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

Calibration By: Mr.Nattapat Rungueang
Calibration Date: 1 December 2025
The Method Used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14
Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 1100180, 1135990, 1100182, 1066609



(Mr. Nattapat Rungueang)
Person in charge

(Mr. Udon Srichana)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM:1995).
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.

บริษัท เทคโนโลยี เคเอสดี จำกัด
DKSH Technology Limited
2533 สุขุมวิท ถนน สุขุมวิท กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Prathunkong, Bangkok 10260
Phone: +66 2636 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C24-10: 30 Jun 2025



Certificate No.: C24250274 Page: 2 of 2

Calibration Results:

Manufacturer: Thermo Scientific Model: ORION 013005MD Electrode Serial No.: YQ1-11982

Before Adjustment

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
25.000 µS/cm	27.29 µS/cm	-2.290 µS/cm	2.00	0.28 µS/cm
84.047 µS/cm	88.25 µS/cm	-4.203 µS/cm	2.00	0.68 µS/cm
1413.5 µS/cm	1444 µS/cm	-30.5 µS/cm	2.00	11 µS/cm
12.881 mS/cm	13.26 mS/cm	-0.379 mS/cm	2.00	0.098 mS/cm

After Adjustment ; at 25.000 µS/cm, 84.047 µS/cm, 1413.5 µS/cm, 12.881 mS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
25.000 µS/cm	25.03 µS/cm	-0.030 µS/cm	2.00	0.28 µS/cm
84.047 µS/cm	84.06 µS/cm	-0.013 µS/cm	2.00	0.68 µS/cm
1413.5 µS/cm	1413 µS/cm	0.5 µS/cm	2.00	11 µS/cm
12.881 mS/cm	12.89 mS/cm	-0.009 mS/cm	2.00	0.098 mS/cm

The End of Certificate

บริษัท เทคโนโลยี เคเอสดี จำกัด
DKSH Technology Limited
2533 สุขุมวิท ถนน สุขุมวิท กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Prathunkong, Bangkok 10260
Phone: +66 2636 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C24-10: 30 Jun 2025



Checklist for Conductivity Meter

Worksheet number: WO-00096654

Instrument type: Conductivity Meter Model: Orion STAR A215 S/N: X58821

Check (receive)		Checklist	Check (send)		Note
01 Dec 2025			01 Dec 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Switch	☒	☐	
☒	☐	4. Keypad	☒	☐	
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Electrode and Connection Cable	☒	☐	
☐	☐	7. Electrode (Dust Protection Hood)	☐	☐	
☒	☐	8. Stand	☒	☐	

Recommend :

Mr.Nattapat Rungueang
Service Engineer

บริษัท เทคโนโลยี เคเอสดี จำกัด
DKSH Technology Limited
2533 สุขุมวิท ถนน สุขุมวิท กรุงเทพมหานคร 10260
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CAL-FM-R53-00: 8 Apr 2025



Certificate of Calibration

Equipment : Digital Thermometer with Probe Certificate No.: C15251274
Manufacturer: Thermo Scientific Job No.: WO-00096654
Model: Orion STAR A215 Issued Date: 04 December 2025
Serial No.: X58821 Page: 1 of 2
ID No.: RYG-EN0200
Condition of the item: Normal

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

Environment Condition : Temperature: 30 °C ± 10 °C
Relative Humidity: 55 % ± 25 %
Voltage: 220 VAC ± 10 %

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

Calibration By : Mr. Nattapat Rungueang
Calibration Date : 01 December 2025
The Method Used : In house method, CAL-WI-69, by comparison with standard thermometer
Traceability : This certificate is traceable to the International System of Unit maintained by: Quality Reborn Co.,Ltd. (QR)



(Mr. Nattapat Rungueang)
Person in charge

(Mr. Tweewong Thaitiang)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM:1995).
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.

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DKSH Technology Limited
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CAL-FM-C15-15: 30 Jun 2025



Certificate No.: C15251274

Page: 2 of 2

Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR25-2474	11 August 2025	11 August 2026

Calibration Results:

Without Adjustment

Sensor Type: RTD Electrode Serial No. YQ1-11962 Channel: -
Diameter (mm): 15 Length (mm): 120 Immersion (mm): 110

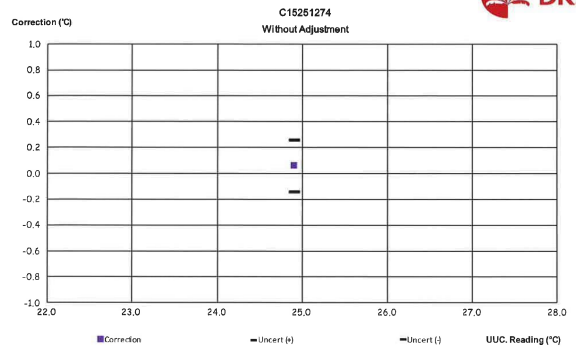
Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.960	24.9	0.060	0.20

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
253 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10260
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CAL-FM-C15-15: 30 Jun 2025



Delivering Growth – in Asia and Beyond.



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ
(Digital Thermometer Checklist)

Equipment : Digital Thermometer with Probe

Certificate No. : C15251274

Serial No. : X58821

Model : Orion STAR A215

Check Date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
1-Dec-2025			1-Dec-2025		
Normal	Defective		Normal	Defective	
		General			
☒	☐	1. สายไฟ (Electric wire)	☒	☐	
☒	☐	2. Adaptor / Power supply 220 / 110 VAC	☒	☐	
☒	☐	3. การทำงาน (On/Off Switch)	☒	☐	
☒	☐	4. การทำงาน (Selector Key)	☒	☐	
☒	☐	5. หน้าจอแสดงผล (Display)	☒	☐	
☐	☐	6. แบตเตอรี่ (Battery)	☐	☐	ไม่มี
☒	☐	7. สภาพตัวเครื่อง (Equipment Body)	☒	☐	
☒	☐	8. หัววัดเซ็นเซอร์ (Sensor / In / Ex)	☒	☐	

Note :

Mr. Nattapat Rungruang
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
253 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10260
Phone: +66 2358 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth – in Asia and Beyond.

SARTORIUS



Accredited by

NSC-TIS-TIS 17025
Calibration 0426

Calibration certificate

Calibration Certificate No. 26BQ0064

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards. Uncertainties of measurements are taken into account when only statements of compliance are made. This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP W108. This certificate relate and apply this equipment only.
Manufacturer	Sartorius	
Type	MCE224S-2S00-JJ	
Serial QM Ident. no.	38101399 RYG_EN0163	
Customer	ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)	
Order no.	278579	616/10 Moo 5 T.Maenamkoo, A.Pluak Daeng, Rayong 21140, Thailand. REVIEW BY <i>Thanitak</i> APPROVED BY <i>D. Humber</i> NEXT CAL DATE: 03/02/27
Number of pages	4	
Date of calibration	03 Feb 2026	

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TIS-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date of issue	03 Feb 2026	Approval of the Calibration Certificate	Person in charge
		Mr. Chonchai Inthana	Chonchai Inthana

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129 Rama 9 Road, Huaykwang
10310 Bangkok

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Version 6.7

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Calibration object

Single range instrument

Model MCE224S-2S00-U
Serial Number 38101399
QM Ident, no | Inventory no, RYG_EN0163 | —

Maximum capacity (Max. load) 220,0000 g
Measured up to 220,0000 g
Scale interval 0,0001 g

Place of calibration

Address According to page 1
Department | Cost center Laboratory Department, | —
Building | Floor — | 1st Floor.
Room Balance Room.
Maximum temperature variation at place of calibration 5 K

Calibration procedure

EURAMET Calibration Guide No. 18, Version 4.0 (11/2015) - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	Testo 174H H/T250743 (Traceable to SI unit through ENTECH)	18 Nov 2026
Test weight set OIML R111 E2	Certificate No.M2508149S_E2(Traceable to SI unit through TCS)	19 Aug 2027

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10310 Bangkok

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Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration 03 Feb 2026
Temperature at place of calibration | Temp. diff. 25 °C | 0,5 K
7 weights - T_{place}
Measuring conditions The installation site is suitable, The device is level, Balance was loaded up to Max before test.
Comments Humidity 49,0 %RH.

Measurement results | Measurement uncertainties

Repeatability	Eccentricity
Test load (nominal): 10 g 200 g	Test load (nominal): 100 g
10 g 200 g	Center 100,0001 g
1 10,0000 g 200,0000 g	Front left 100,0002 g
2 10,0000 g 199,9999 g	Back left 100,0002 g
3 10,0000 g 200,0000 g	Back right 100,0000 g
4 10,0000 g 200,0001 g	Front right 100,0000 g
5 9,9999 g 199,9999 g	Maximum deviation from centric loading indication
6 10,0000 g 200,0000 g	$ \Delta_{\text{ecc}} _{\text{max}} = 0,0001 \text{ g}$
7 10,0000 g 199,9999 g	
8 10,0000 g 200,0000 g	
9 9,9999 g 200,0001 g	
10 10,0000 g 200,0000 g	
$s = 0,00004 \text{ g}$ $s = 0,00007 \text{ g}$	

Testload	Indication	Error	Expansion factor	Uncertainty	Uncertainty relative
L	I	E	k	$U(E)$	$U_{\text{rel}}(E)$
0,0100 g	0,0100 g	0,0000 g	2,00	0,00012 g	1,2 %
0,1000 g	0,1000 g	0,0000 g	2,00	0,00017 g	0,17 %
0,5000 g	0,5000 g	0,0000 g	2,00	0,00017 g	0,034 %
1,0000 g	1,0000 g	0,0000 g	2,00	0,00017 g	0,017 %
5,0000 g	5,0000 g	0,0000 g	2,00	0,00017 g	0,0034 %
10,0000 g	10,0000 g	0,0000 g	2,00	0,00017 g	0,0017 %
20,0000 g	20,0000 g	0,0000 g	2,00	0,00018 g	0,00088 %
50,0000 g	50,0000 g	0,0000 g	2,00	0,00018 g	0,00037 %
100,0000 g	100,0001 g	0,0001 g	2,00	0,00021 g	0,00021 %
200,0000 g	200,0000 g	0,0000 g	2,00	0,00030 g	0,00015 %
220,0000 g	220,0001 g	0,0001 g	2,00	0,00034 g	0,00015 %
Maximum error of indication		$ E _{\text{max}} = 0,0001 \text{ g}$			

$U_{\text{rel}}(E)$ is the quotient of $U(E)$ and test load L . The uncertainty of measurement $U(E)$ is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

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Interpretation of measurement results | Appendix to the calibration certificate

Uncertainty of measurement in use

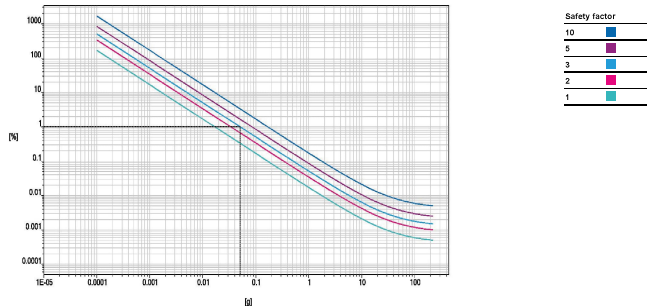
Device adjusted before measurement Yes
Temperature deviation considered 1,5 K (isoCAL active)
Temperature coefficient considered $1 \cdot 10^{-6}/\text{K}$

Uncertainty of the weighing result $U_0(W)$ $U_0(W) = 0,00017 \text{ g} + 4,25 \cdot 10^{-6} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication	Uncertainty $U_0(W)$	Uncertainty relative $U_0(W)_{\text{rel}}$
1 %	2,2000 g	0,00018 g	0,0082 %
25 %	55,0000 g	0,00040 g	0,00073 %
50 %	110,0000 g	0,00064 g	0,00058 %
75 %	165,0000 g	0,00087 g	0,00053 %
100 %	220,0000 g	0,0011 g	0,00050 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy 1,00 %
Safety factor 3
Minimum sample weight 0,0507 g

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Metrology Center

SCI ECO Services Company Limited

51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Bangkok Tel : +668 9205 6851 , +669 81924 0059

Saraburi Tel : +669 8247 2360

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



Certificate No. T251530

Certificate of Calibration

Page 1 of 3

Equipment : Chamber (Oven)

Manufacturer : MEMMERT

Model : UF 110

Serial No. : B416.2420

Customer Code : RYG_EN0012

ID No. : T6444A5

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

616/10 Moo 5 T.Maenamkoo,

A.Pluakdaeng, Rayong 21140

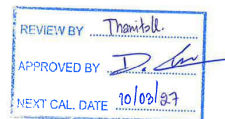
Customer Location : ENVIRONMENT LABORATORY

Date of Receipt : 3 September 2025

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

Approved By : Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 17 SEP 2025



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.



Certificate No. T251530

Page 2 of 3

Calibration Report

Equipment : Chamber (Oven)
Date of Calibration : 10 September 2025
Environment : Temperature : 35.7-36.6 °C
Line Voltage : 226.8-233.7 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2019) 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
RTD	100 ohm	30-(CH1-10)	T242203	9 November 2025
DATA LOGGER	34970A	T47	T242203	9 November 2025

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 3 Hour 29 Minute At 104 °C
Fresh Air Damper ☒ Open ☒ Min ☐ Medium ☐ Max
☐ Close
☐ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By. 

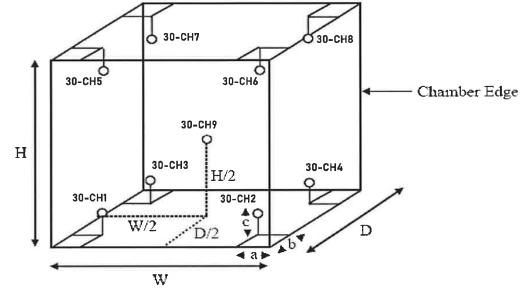
FM-TL07 102/27-03-68



Certificate No. T251530

Page 3 of 3

Calibration Report



Remark : Internal Dimensions of Chamber : W (Width) = 56 cm , H (Height) = 48 cm. and D (Depth) = 40 cm.
Size of Installed Standard sensor number 30-CH1 to number 30-CH8 : a = 5 cm , b = 5 cm. and c = 5 cm.
Size of Installed Standard sensor number 30-CH9 : W/2 = 56 cm/2 , H/2 = 48 cm/2 and D/2 = 40cm/2

Measurement Results

Average Standard Reading at each position (°C)									
Calibration Point	30-CH1	30-CH2	30-CH3	30-CH4	30-CH5	30-CH6	30-CH7	30-CH8	30-CH9
104	104.02	103.70	104.01	104.16	104.11	104.08	104.01	104.33	103.61
180	180.67	178.78	180.38	179.85	179.16	180.27	180.98	181.04	179.49

Chamber (Oven)		Temperature Distribution				
Setting °C	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)
	Min	Max				
104.0	103.9	104.1	104.0	0.08	0.61	0.42
180.0	179.9	180.1	180.0	0.21	1.51	0.52

* 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 % .

End of Certificate.

Approved By. 

FM-TL07 102/27-03-68

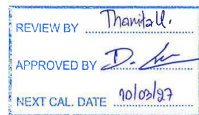


Certificate No. T251529

Page 1 of 3

Certificate of Calibration

Equipment : DIGESTION UNIT
Manufacturer : Gerhardt, Germany
Model : KT - 20S
Serial No. : 572021009
Customer Code : RYG_EN0188
ID No. : T6452A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)



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

Customer Location : ENVIRONMENT LABORATORY

Date of Receipt : 3 September 2025

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 17 SEP 2025
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-TL04 102/27-03-68



Certificate No. T251529

Page 2 of 3

Calibration Report

Equipment : DIGESTION UNIT
Date of Calibration : 10 September 2025
Environment : Temperature : 21.7 - 24.3 °C
Line Voltage : 226.9 - 232.1 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert four standard thermocouples type S into its chamber , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T10.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	Type S	M20A1-(CH1-CH4)	T250750	14 May 2026
DATA LOGGER	34970A	T261	T250750	14 May 2026

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 46 Minute At 380 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Close
☒ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

Approved By. 

FM-TL05 102/27-03-68



Calibration Report



DISPLAY CONTROL (FRONT)

Measurement Results

Cal.Point	Setting	Reading	STD.	Position of Standards at Block									
(°C)	(°C)	(°C)	Reading	M20A1-CH1 Hole 1	M20A1-CH2 Hole 2	M20A1-CH3 Hole 3	M20A1-CH4 Hole 4	M20A1-CH1 Hole 5	M20A1-CH2 Hole 6	M20A1-CH3 Hole 7	M20A1-CH4 Hole 8	M20A1-CH1 Hole 9	M20A1-CH2 Hole 10
380	360	360	Max °C	381.2	380.5	381.0	381.0	379.2	380.8	381.3	377.7	382.8	381.5
			Min °C	380.7	380.0	380.4	380.5	378.6	380.1	380.9	377.2	381.9	380.9
			Average °C	381.0	380.3	380.7	380.8	378.9	380.4	381.1	377.5	382.4	381.2
			Stability ±°C	0.3	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.5	0.3

Cal.Point	Setting	Reading	STD.	Position of Standards at Block									
(°C)	(°C)	(°C)	Reading	M20A1-CH3 Hole 11	M20A1-CH4 Hole 12	M20A1-CH1 Hole 13	M20A1-CH2 Hole 14	M20A1-CH3 Hole 15	M20A1-CH4 Hole 16	M20A1-CH1 Hole 17	M20A1-CH2 Hole 18	M20A1-CH3 Hole 19	M20A1-CH4 Hole 20
380	360	360	Max °C	382.5	377.2	378.7	378.8	378.5	379.9	383.3	381.0	382.4	381.1
			Min °C	381.7	376.5	378.5	378.5	378.1	379.5	382.7	380.6	381.6	380.4
			Average °C	382.1	376.8	378.6	378.7	378.3	379.7	383.0	380.8	382.0	380.8
			Stability ±°C	0.4	0.4	0.1	0.2	0.2	0.2	0.3	0.2	0.4	0.4

The expanded uncertainty of temperature measurement was ± 1.8 °C

The calibration result apply only the above calibrated item

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

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

End of Certificate.

Approved By:

FM-TL05 102/27-03-68

Instrument Details

Purpose

This section describes the as found system configuration.

Details

Spectrometer 1

Manufacturer	Agilent Technologies
Name	5800 VDV
Model Number	G8018A
Sample Introduction	Double pass glass cyclonic spraychamber and seaspray nebulizer
Serial Number	MY2530CQ06
Firmware Revision	6599

Chiller 1

Manufacturer	Agilent Technologies
Name	Other Unspecified
Other Unspecified Name	Recirculating Chiller
Model Number	Other Unspecified
Other Unspecified Model Number	G8496A
Serial Number	2506-00251

Autosampler 1

Manufacturer	Agilent Technologies
Name	SPS4
Model Number	G8410A
Serial Number	AU252321415

Switching Valve Accessory 1

Manufacturer	Agilent Technologies
Name	AVS 7
Model Number	G8495
Serial Number	MY2530MR06

Certificate of System Qualification

ES-IQ

System ID: MY2530CQ06
Organization Name: ALS Laboratory Group (Thailand) Co.Ltd.
Organization Location: 616/10 Moo 5, T. Mae Nam Khu, A. Phrak Daeng, Rayong, 21140

Date: August 22, 2025 3:25:12 PM
EQP Name: Agilent/Recommended

EQP Revision: ES.02.50
Overall Qualification Status: Pass



Purchase Order Details

Overall Test Status: Completed

Preparation and Installation Details

Overall Test Status: Completed

Documentation

Overall Test Status: Completed

Product Quality Assurance Details

Overall Test Status: Completed

Startup

Overall Test Status: Pass

Date: August 22, 2025 3:25:12 PM
System ID: MY2530CQ06

Page 1 / 5

Electronic Signature

Purpose

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Details

Full Name of Signer: Panthep Kurasathain
Logged On User Name: panthep_kurasathain@agilent.com
Signature Creation Date: August 22, 2025
Reason for Signature: Executed protocol and published this original version of document

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS/ClearStore/AceSelfQualification.

Regulatory Disclaimer

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

Warranty

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

User Name: panthap_jurachaiha
Report Generated by Hostname: AG-SC031654RX
System ID: MY2530C008
Print Date: August 22, 2025 3:25:14 PM

IQHW ALS 5800 22Aug25 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
August 22, 2025 3:09:31 PM	Audit	SessionCreated	Session	Host Name: AG-SC031654RX, Drive Serial Number: ECF6A48D
August 22, 2025 3:05:31 PM	start	Configuration	Session	None
August 22, 2025 3:05:31 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
August 22, 2025 3:12:40 PM	Audit	Epl.loaded	Session	EOP details for primary technique [E6] - File path: [Photos\Photos\E6\Config\all_ene\02.50\En_02.50.epl], EOP File Name: [E6_02.50.epl], EOP Name: [Agilent\commented\Protocol Revision [E6_02.50]
August 22, 2025 3:12:43 PM	End	Configuration	Session	None
August 22, 2025 3:12:54 PM	start	Qualification	Session	IQ
August 22, 2025 3:12:55 PM	start	Execution	Purchase Order Details : Purchase Order	None
August 22, 2025 3:13:54 PM	start	Execution	Preparation and Installation Details : Preparation	None
August 22, 2025 3:13:55 PM	End	Execution	Purchase Order Details : Purchase Order	Run Count : 1
August 22, 2025 3:14:22 PM	start	Execution	Documentation : Documentation	None
August 22, 2025 3:14:23 PM	End	Execution	Preparation and Installation Details : Preparation	Run Count : 1

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Date: August 22, 2025 3:25:12 PM
System ID: MY2530C008

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User Name: panthap_jurachaiha
Report Generated by Hostname: AG-SC031654RX
System ID: MY2530C008
Print Date: August 22, 2025 3:25:14 PM

IQHW ALS 5800 22Aug25 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
August 22, 2025 3:14:44 PM	start	Execution	Product Quality Assurance Details : Quality Assurance	None
August 22, 2025 3:14:44 PM	End	Execution	Documentation : Documentation	Run Count : 1
August 22, 2025 3:14:56 PM	start	Execution	Startup : Startup	None
August 22, 2025 3:14:57 PM	End	Execution	Product Quality Assurance Details : Quality Assurance	Run Count : 1
August 22, 2025 3:15:04 PM	End	Execution	Startup : Startup	Run Count : 1
August 22, 2025 3:15:10 PM	End	Qualification	Session	IQ
August 22, 2025 3:15:10 PM	start	Reporting	Session	None
August 22, 2025 3:23:41 PM	Audit	Reporting	Session	Report Generated : Certificate
August 22, 2025 3:24:10 PM	Audit	Reporting	Session	Report Generated : Report

Page 2 / 2

Date: August 22, 2025 3:25:12 PM
System ID: MY2530C008

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Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T251980

Certificate of Calibration

Page 1 of 6

Equipment : Hot Block

Manufacturer : environmental express

Model : SC196

Serial No. : 2025CECW6557

Customer Code : RYG_EN0227

ID No. : T6795A5

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

616/10 Moo 5, T.Maenamkoo, A.Pluakdaeng,

Rayong 21140

Customer Location : Laboratory

Date of Receipt : 29 October 2025

Calibrated By : Boonchai Suriyawong (Site Calibration Manager)

Approved By : / Sujjar Nakhakred (Site Calibration Manager)

Date of Issue : 14 NOV 2025

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.



Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260

Certificate No. T251980

Page 2 of 6

Calibration Report

Equipment : Hot Block
Date of Calibration : 4-5 November 2025
Environment : Temperature : 24.4-25.9 °C
Line Voltage : 221.4-225.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

- This equipment was calibrated by insert 20 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. 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	TN91-TN100	T242036	3 December 2025
TC	TYPE T	TN101-TN110	T242036	3 December 2025
DATA LOGGER	34970A	T121	T242036	3 December 2025
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)
- Condition of calibrated item : good
Equipment Description :
Time Constant - Hour 40 Minute At 95 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment :
(X) without adjustment () after adjustment

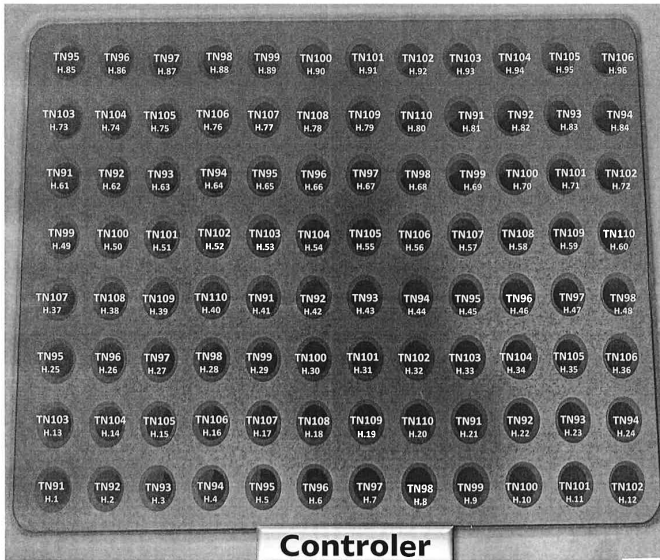
Approved By :



Certificate No. T251980

Page 3 of 6

Calibration Report



** H = Hole

Approved By. 

FM-TL05 102/27-03-68



Certificate No. T251980

Calibration Report

Page 4 of 6

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN91 H.1	TN92 H.2	TN93 H.3	TN94 H.4	TN95 H.5	TN96 H.6	TN97 H.7	TN98 H.8	TN99 H.9	TN100 H.10
95	95.48	95.56	95.43	95.48	95.33	95.15	95.70	95.28	95.31	95.21
TN101 H.11	TN102 H.12	TN103 H.13	TN104 H.14	TN105 H.15	TN106 H.16	TN107 H.17	TN108 H.18	TN109 H.19	TN110 H.20	
95.36	95.58	95.24	94.92	95.08	94.77	94.93	95.63	95.54	95.75	
TN91 H.21	TN92 H.22	TN93 H.23	TN94 H.24	TN95 H.25	TN96 H.26	TN97 H.27	TN98 H.28	TN99 H.29	TN100 H.30	
95.12	95.85	95.18	95.58	95.44	95.12	95.52	94.80	95.38	94.66	
TN101 H.31	TN102 H.32	TN103 H.33	TN104 H.34	TN105 H.35	TN106 H.36	TN107 H.37	TN108 H.38	TN109 H.39	TN110 H.40	
95.92	96.01	95.96	94.05	94.32	94.13	95.40	95.95	95.91	95.69	
TN91 H.41	TN92 H.42	TN93 H.43	TN94 H.44	TN95 H.45	TN96 H.46	TN97 H.47	TN98 H.48	TN99 H.49	TN100 H.50	
95.42	95.55	95.72	95.43	95.27	96.04	94.04	95.17	95.50	94.36	
TN101 H.51	TN102 H.52	TN103 H.53	TN104 H.54	TN105 H.55	TN106 H.56	TN107 H.57	TN108 H.58	TN109 H.59	TN110 H.60	
95.77	96.03	95.87	94.24	94.09	94.18	94.23	94.49	94.37	94.11	
TN91 H.61	TN92 H.62	TN93 H.63	TN94 H.64	TN95 H.65	TN96 H.66	TN97 H.67	TN98 H.68	TN99 H.69	TN100 H.70	
95.38	95.58	95.51	95.68	95.40	96.00	94.40	95.33	94.93	94.17	
TN101 H.71	TN102 H.72	TN103 H.73	TN104 H.74	TN105 H.75	TN106 H.76	TN107 H.77	TN108 H.78	TN109 H.79	TN110 H.80	
95.00	94.83	95.74	94.45	94.56	94.26	94.31	94.94	94.66	94.26	
TN91 H.81	TN92 H.82	TN93 H.83	TN94 H.84	TN95 H.85	TN96 H.86	TN97 H.87	TN98 H.88	TN99 H.89	TN100 H.90	
95.10	95.00	94.72	94.84	95.06	96.01	94.29	95.61	95.06	95.06	
TN101 H.91	TN102 H.92	TN103 H.93	TN104 H.94	TN105 H.95	TN106 H.96					
95.86	95.91	95.71	94.35	94.36	95.79					

Approved By. 

FM-TL05 102/27-03-68



Certificate No. T251980

Page 5 of 6

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN91 H.1	TN92 H.2	TN93 H.3	TN94 H.4	TN95 H.5	TN96 H.6	TN97 H.7	TN98 H.8	TN99 H.9	TN100 H.10
105	105.58	105.67	105.62	105.52	105.37	105.69	104.52	105.19	104.69	104.78
TN101 H.11	TN102 H.12	TN103 H.13	TN104 H.14	TN105 H.15	TN106 H.16	TN107 H.17	TN108 H.18	TN109 H.19	TN110 H.20	
104.99	104.68	104.31	104.54	104.98	104.86	104.97	105.65	105.43	105.18	
TN91 H.21	TN92 H.22	TN93 H.23	TN94 H.24	TN95 H.25	TN96 H.26	TN97 H.27	TN98 H.28	TN99 H.29	TN100 H.30	
105.58	105.67	105.62	105.52	105.37	105.69	104.52	105.19	104.69	104.78	
TN101 H.31	TN102 H.32	TN103 H.33	TN104 H.34	TN105 H.35	TN106 H.36	TN107 H.37	TN108 H.38	TN109 H.39	TN110 H.40	
104.99	104.68	104.31	104.54	104.98	104.86	104.97	105.65	105.43	105.18	
TN91 H.41	TN92 H.42	TN93 H.43	TN94 H.44	TN95 H.45	TN96 H.46	TN97 H.47	TN98 H.48	TN99 H.49	TN100 H.50	
105.78	105.77	105.61	105.55	105.13	105.88	104.59	105.91	105.75	104.49	
TN101 H.51	TN102 H.52	TN103 H.53	TN104 H.54	TN105 H.55	TN106 H.56	TN107 H.57	TN108 H.58	TN109 H.59	TN110 H.60	
105.33	105.53	105.68	104.33	104.61	104.24	104.44	104.76	104.48	104.18	
TN91 H.61	TN92 H.62	TN93 H.63	TN94 H.64	TN95 H.65	TN96 H.66	TN97 H.67	TN98 H.68	TN99 H.69	TN100 H.70	
105.60	105.62	105.53	105.80	105.27	105.85	104.31	105.58	104.75	104.23	
TN101 H.71	TN102 H.72	TN103 H.73	TN104 H.74	TN105 H.75	TN106 H.76	TN107 H.77	TN108 H.78	TN109 H.79	TN110 H.80	
104.89	105.25	105.83	104.33	104.58	104.41	104.76	105.29	104.95	104.55	
TN91 H.81	TN92 H.82	TN93 H.83	TN94 H.84	TN95 H.85	TN96 H.86	TN97 H.87	TN98 H.88	TN99 H.89	TN100 H.90	
105.00	105.03	104.49	104.77	105.08	105.69	104.12	105.53	105.06	104.13	
TN101 H.91	TN102 H.92	TN103 H.93	TN104 H.94	TN105 H.95	TN106 H.96					
105.71	105.71	105.67	104.99	105.15	104.52					

Approved By. 

FM-TL05 102/27-03-68



Certificate No. T251980

Page 6 of 6

Calibration Report

Measurement Results

Hot Block			Temperature Distribution			
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max				
94.0	-	94.0	95.31	0.20	0.90	2.00
104.0	-	104.0	105.74	0.20	1.10	2.00

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 %.

End of Certificate

Approved By. 

FM-TL05 102/27-03-68

ALS Laboratory Group (Thailand) Co., Ltd.

Automatic Mercury Analyzer
RA-7000A with SANPRA™3
INSTALLATION REPORT

SERIAL No. RA-7000A : 251040235

Soft version : Ver 1.5.0.0

ROM version : Ver 1.5.0.00

SERIAL No. SANPRA 3 : 241070094

ROM version : Ver 1.4.2.00

REVIEW BY Thamfoll

APPROVED BY D

NEXT CAL DATE 31 Jul 2026

DATE : 21 JULY 2025

DUE DATE : 21 JULY 2026

INSPECTED BY : Chayan T.
(Chayan T.)APPROVED BY : Natthaphong P.
(Natthaphong P.)

Kinetic Solutions Company Limited.

2, Soi Lat Krabang 1, Lat Krabang Subdistrict,

Lat Krabang District, Bangkok 10520

Tel. (+66) 062-789-5221

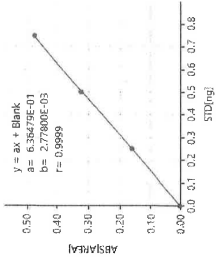
บริษัท คีเนติก โซลูชั่นส์ จำกัด
KINETIC SOLUTIONS CO., LTD.

Inspection

ITEMS	SPECIFICATIONS	RESULT	JUDGE
1. Quantity	Accessories are completed.	GOOD	OK
2. Appearance	No visible damage. Correctly placed and connected.	GOOD	OK
3. Indication	Plate and Label are indicated.	GOOD	OK
4. Self check	All items are "PASS"	GOOD	OK
5. Calibration Curve	0-0.15 µg/L : Max Dev. 5.0%	3.00%	OK
6. Repeatability	0.05 µg/L (n=6)	0.0489 µg/L	OK
7. Blank	After 40ppb	1.69%	OK
7. Blank	MDL	0.005	OK
		3 x S.D. < 0.5ppt	0.40219

TITLE 0-0.15µg/L
DATE 2025/07/18 14:07
UNIT RA-7000A(SN:251040235) + SANPRA 3 (UNIT A) (SN:241070094)
OPERATOR Kinetic Solutions

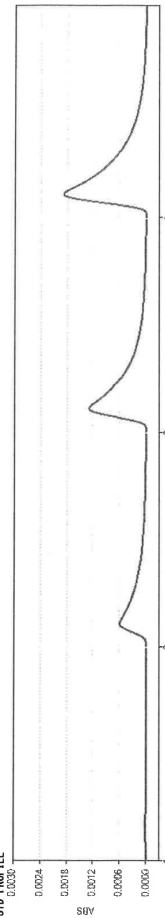
CALIBRATION



METHOD : Method1
Preconcentration : NO
P1 : (1+1)H2SO4
P2 : 10mM SnCl2

STD TABLE	SNP NO.	STD (µg/L)	SVOL (mL)	CVOL (mL)	DVOL (mL)	STD (mL)	AREA (mV)	MEAS (mV)	DEV (%)	NOTE
1	14	10.000	0.000	5.000	5.000	0.000	0.00278	0.0000	—	
2	2	10.000	0.025	5.000	5.000	0.250	0.16149	0.2490	0.2	
3	1	10.000	0.050	5.000	5.000	0.500	0.32298	0.4980	0.1	
4	10	10.000	0.075	5.000	5.000	0.750	0.477360	0.7468	0.5	

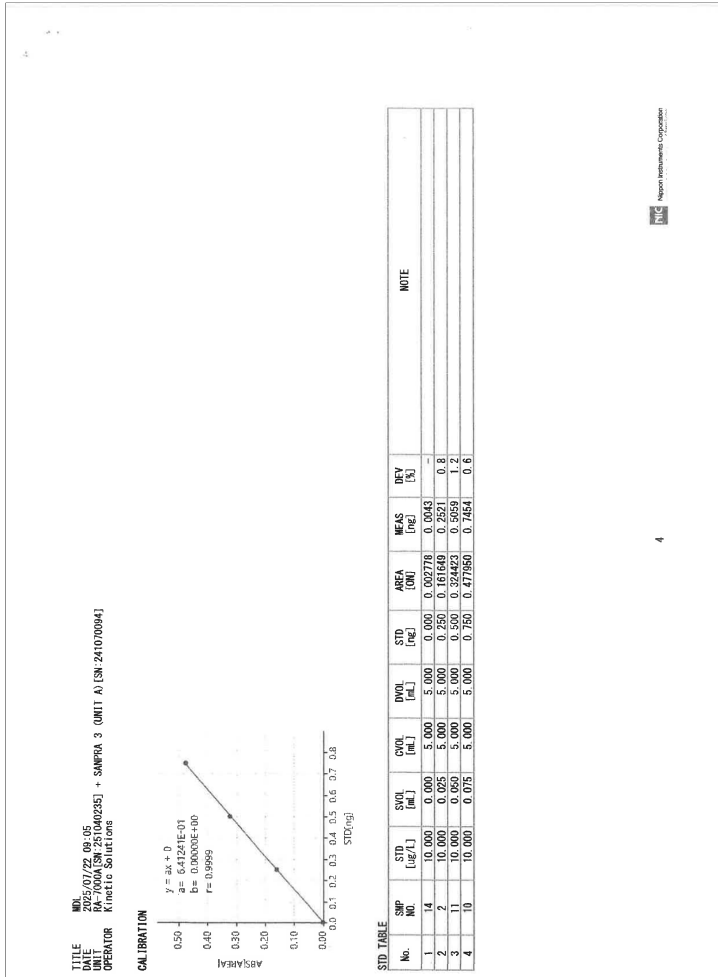
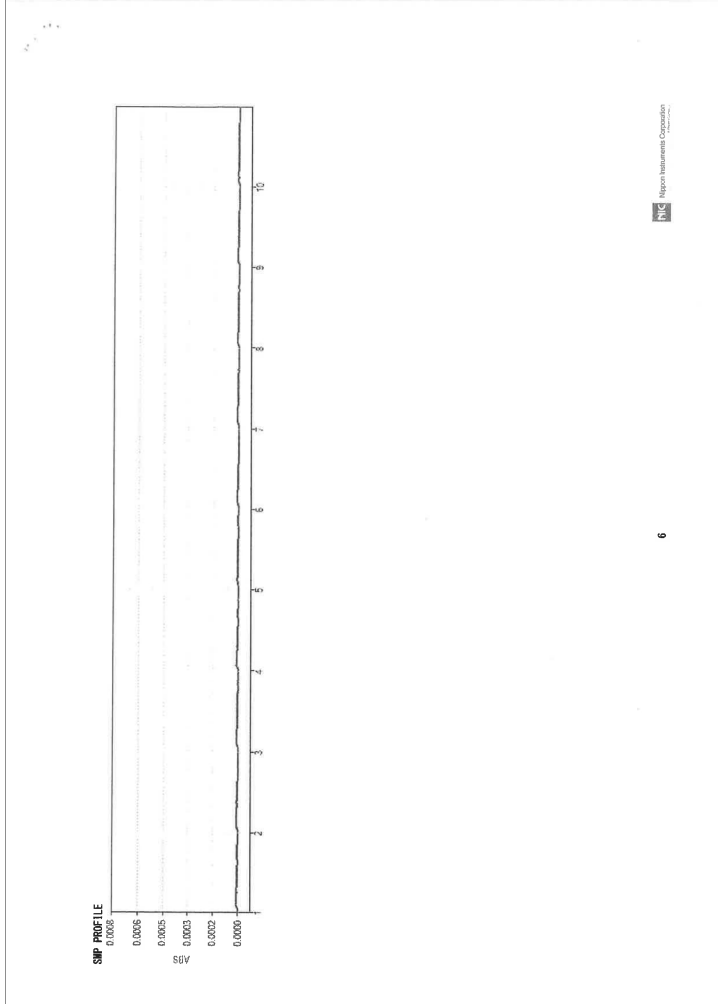
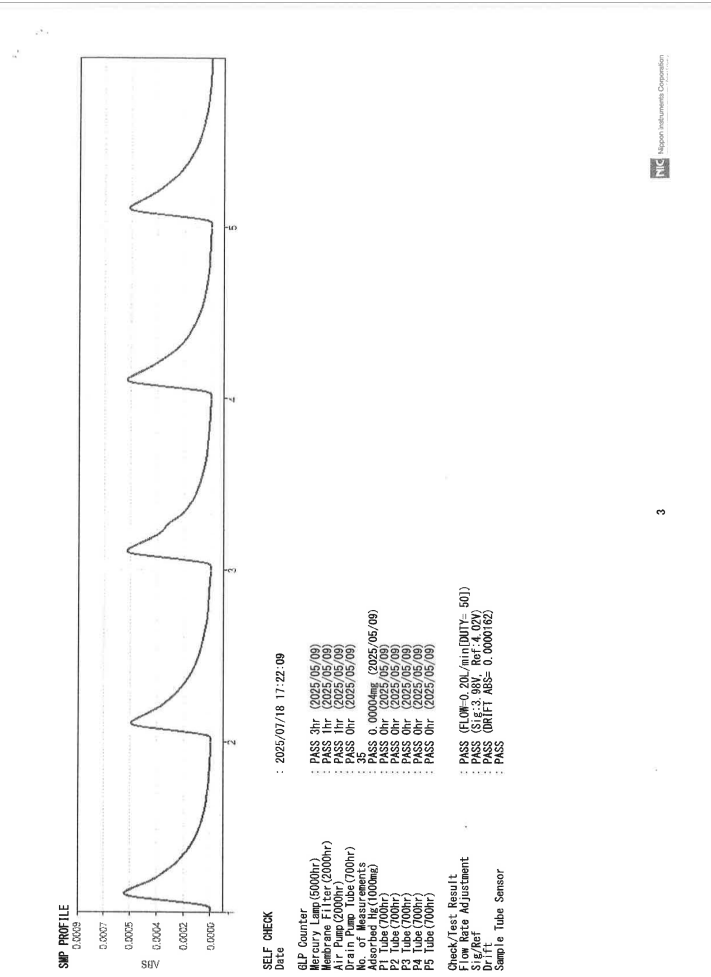
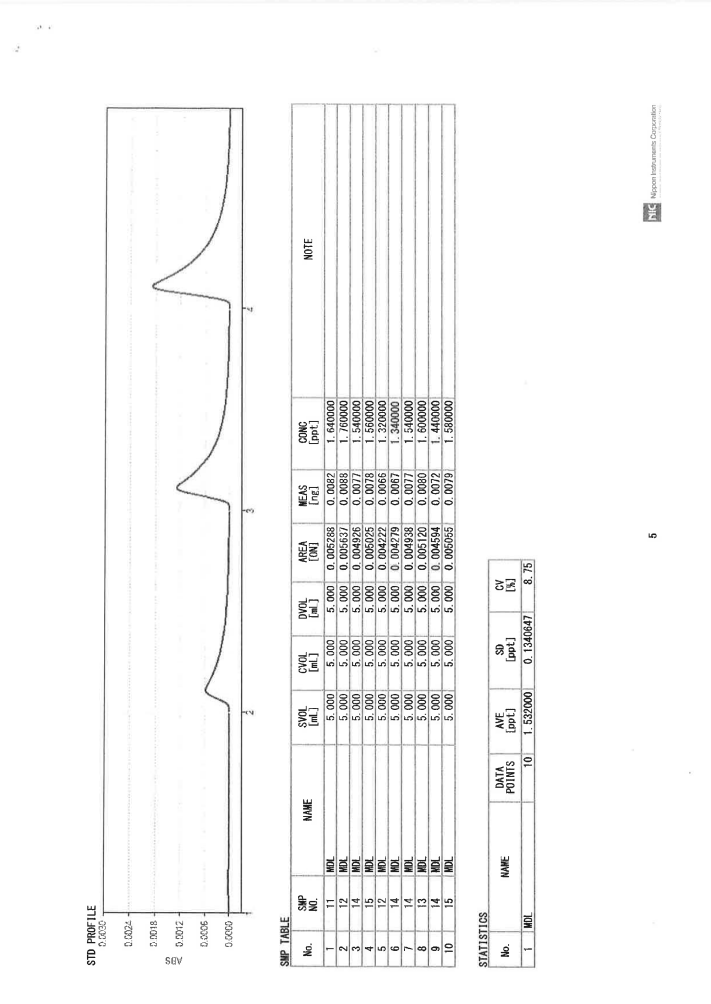
STD PROFILE



SMP TABLE											
No.	SMP NO.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [mV]	MEAS [mg]	CMC [μg/L]	RECOVERY [%]	NOTE	
1	38	Check STD (0.050μg/L)	5.000	5.000	5.000	0.160103	0.2472	0.149	98.0		
2	39	Check STD (0.050μg/L)	5.000	5.000	5.000	0.157533	0.2431	0.149	96.0		
3	40	Check STD (0.050μg/L)	5.000	5.000	5.000	0.162738	0.2504	0.150	100.0		
4	41	Check STD (0.050μg/L)	5.000	5.000	5.000	0.161678	0.2497	0.150	100.0		
5	43	Check STD (0.050μg/L)	5.000	5.000	5.000	0.165449	0.2556	0.151	102.0		

STATISTICS

No.	NAME	DATA POINTS	AVE (µg/L)	SD (µg/L)	CV (%)
1	Check STD (0.050µg/L)	5	0.0489	0.0084	1.69





Metrology

SCI ECO Services Company Limited

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

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

Bangkok Tel : +668 9205 6851, +669 8247 2360

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



Metrology

SCI ECO Services Company Limited

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



Certificate No. T250353

Calibration Report

Page 2 of 4

Certificate No. T250353

Page 1 of 4

Certificate of Calibration

Equipment : Autoclave

Manufacturer : TOMY

Model : SX-700

Serial No. : 48134190

Customer Code : BKK_ML0041

ID No. : T7725A3

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Washing Room

Date of Receipt : 26 February 2025

Calibrated By : Boonchai Suriyawong (Site Calibration Manager)

Approved By :  / Sujar Naknakred (Site Calibration Manager)

Date of Issue : 10 Mar 2025

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 Metrology.

FM-L14 119/18-08-66

Equipment : Autoclave
Date of Calibration : 4 March 2025
Environment : Temperature : 22.2-25.4 °C
Line Voltage : 221.1-224.7 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 3 standard temperature recorder into its chamber and test according to WI-T23 inhouse method.(based on BS 2646-1 : 2021)
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	Standard No.	Certificate No.	Due Date
1. Temperature recorder	RTD	T210	T242028	11 December 2025
2. Temperature recorder	RTD	T211	T242029	11 December 2025
3. Temperature recorder	RTD	T212	T242030	11 December 2025

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 :

Pressure Indicator 0.11-0.12 MPa At 121 °C Holding time 20 minute

5. Adjustment :

(X) without adjustment

() after adjustment

Approved By. 

FM-L15 118/18-08-66



Metrology

SCI ECO Services Company Limited

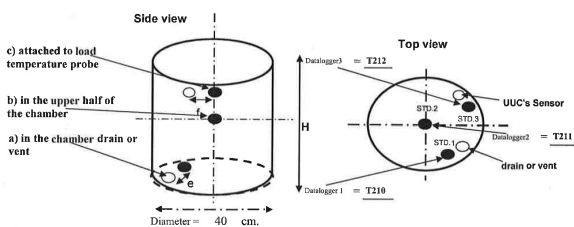
33/2 Moo 3, T.Banpa, A.Kaengkhohi, Saraburi 18110, Thailand.



Certificate No. T250353

Page 3 of 4

Calibration Report



Remark :

Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent $e \leq 10$ cm.(less than or be equal to 10 cm.)

Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)

Size of Installed Standard sensor STD.3 : Distance UUC's Sensor $f = 2$ cm.

Measurement Results :

Calibration Point	Average Standard Reading at each position (°C)		
	T210	T211	T212
121	121.2	121.1	121.1

Setting (°C)	Autoclave			Temperature Distribution				
	Min	Max	Average	Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor k
121	-	121	121.2	121.2	0.1	0.1	0.65	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 % .

End of Certificate

Approved By. _____

FM-L15 118/18-08-66



Metrological Center

SCI ECO Services Company Limited

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

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

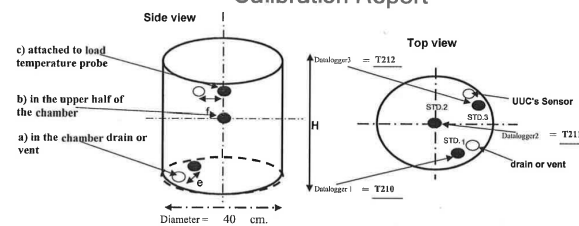
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T250353

TEST REPORT (BKK_ML0041)

Page 4 of 4

Calibration Report



Remark :

Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent $e \leq 10$ cm.(less than or be equal to 10 cm.)

Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)

Size of Installed Standard sensor STD.3 : Distance UUC's Sensor $f = 2$ cm.

Measurement Results :

Calibration Point	Average Standard Reading at each position (°C)		
	T210	T211	T212
121	121.18	121.12	121.13

Setting (°C)	Autoclave			Temperature Distribution				
	Min	Max	Average	Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor k
121	-	121	121.18	121.16	0.10	0.10	0.65	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 % .

End of Certificate

Approved By. 

FM-L13 108/30-05-37



Certificate of Calibration

Cert. No.: 25TM1235
Page : 1 of 3

Equipment : Incubator
Manufacturer : Memmert
Model : IPP750eco
Serial No. : V821.0172
ID No. : BKK_ML0231

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

Received Order : 21 August 2025
Calibration Date : 21 August 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Rutnanapachai

Approved by :
() Chakrit Waewwanjua
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 25 August 2025

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

REVIEW BY Sithichok T.
APPROVED BY
NEXT CAL DATE..... 21/08/26



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2508-0459OC-2
Procedure Used :-

Cert. No.: 25TM1235
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	25LM82	TPA	17 May 2026

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

3. This measurement result is traceable to the International System of Unit maintained through :

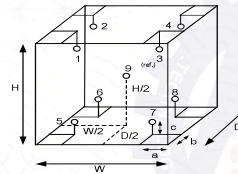
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration : (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	21	20
REL.Humid. (%)	62	65
AC Supply (Volt)	222	221



Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.75 m³

Position :	Ref. Std. ID No.:
1	25-01RTD-01
2	25-01RTD-02
3	25-01RTD-03
4	25-01RTD-04
5	25-01RTD-05
6	25-01RTD-06
7	25-01RTD-07
8	25-01RTD-08
9 (ref.)	25-01RTD-09



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2508-0459OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 25TM1235
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.12	0.37	0.43	2
37.0	37.0	37.0	0.15	0.47	0.49	2
41.5	41.5	41.5	0.13	0.79	0.84	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.834	34.929	34.924	34.849	34.856	34.954	35.002	35.002	35.127	0.30
37.0	36.940	37.065	37.010	36.921	36.883	36.973	37.043	37.045	37.235	0.31
41.5	41.641	41.838	41.742	41.484	41.249	41.427	41.466	41.495	41.926	0.34

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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Certificate of Calibration

Cert. No.: 25TM525
Page : 1 of 3

Equipment : Hot Air Oven
Manufacturer : Binder
Model : ED 240/E2
Serial No. : 00-15533
ID No. : BKK_ML0013

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : Media Preparation Room

Received Order : 08 October 2025
Calibration Date : 09 October 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Uthen Kankawi

Approved by :
() Chakrit Waewwanjua
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 16 October 2025

REVIEW BY Sithichok T.
APPROVED BY
NEXT CAL DATE..... 09/04/27

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2510-0042OC-3

Cert. No.: 25TM525
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY59003411	24LM192	TPA	24 Dec 2025

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

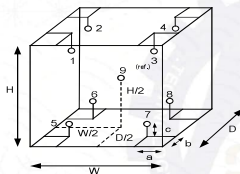
3. This measurement result is traceable to the International System of Unit maintained through :

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

a = 5,0 cm
b = 5,0 cm
c = 5,0 cm

Dimension of Chamber :

D = 0,50 m
W = 0,80 m
H = 0,60 m
Capacity = 0,24 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	24
REL.Humid. (%)	54	56
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	23-20TC-01
2	23-20TC-02
3	23-20TC-03
4	23-20TC-04
5	23-20TC-05
6	23-20TC-06
7	23-20TC-07
8	23-20TC-08
9 (ref.)	23-20TC-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2510-0042OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 25TM525
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
170	170	170	0.45	1.3	2.3	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
170	169.588	170.427	168.486	168.900	169.725	169.499	168.946	169.327	169.529	1.3

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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 25TM460
Page : 1 of 3

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 45
Serial No. : L712.0429
ID No. : BKK_ML0056

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

Received Order : 04 March 2025
Calibration Date : 04 March 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Ruttanapachai

Approved by :
() Chakrit Waewwanjua
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 06 March 2025

REVIEW BY *Sithichok T.*
APPROVED BY *[Signature]*
NEXT CAL DATE: 04/03/26



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2503-0006OC-2

Cert. No.: 25TM460
Page : 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44073381	23LM73	TPA	18 May 2025

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.

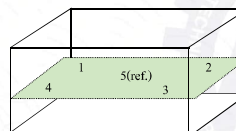
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	49	220
Finished of Calibration	25	51	221



Front

Position :	Ref. Std. S/N.:
1	4803988-006
2	4803988-007
3	4804539-014
4	4804539-015
5(ref.)	4804539-016

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2503-0006OC-2
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 25TM460
 Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
44.5	44.5	44.5	44.489	44.469	44.497	44.476	44.479	0.15
45.0	45.0	45.0	44.990	44.966	44.997	44.983	44.980	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.045	0.035	2
45.0	0.047	0.031	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 %.

-o0o-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 26TM111
 Page : 1 of 3

Equipment : Water Bath
 Manufacturer : Memmert
 Model : WNE 45
 Serial No. : L712.0429
 ID No. : BKK_ML0056

REVIEW BY Sithichok T.
 APPROVED BY
 NEXT CAL DATE 04/02/27

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

Received Order : 04 February 2026
 Calibration Date : 04 - 05 February 2026
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %
 AC Line Voltage : (220 ± 22) V

Calibrated by : Preecha Hiahib
 Approved by :
 Approved Signatory

() Chakrit Waewwanjua
 (✓) Suwit Imjai
 () Kunchit Promprat

Issue Date : 16 February 2026

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2602-0026OC-1
 Procedure Used :-

Cert. No.: 26TM111
 Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY59003411	25LM177	TPA	26 Dec 2026

2. This certificate is valid only to the item calibrated on date and place of calibration.
 3. This measurement result is traceable to the International System of Unit maintained through :

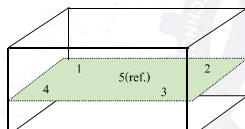
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	55	220
Finished of Calibration	20	69	220



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005



Equipment : Water Bath
 Condition As-Received : Used Item
 Reference : 2602-0026OC-1
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 26TM111
 Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
44.5	44.4	44.4	44.462	44.470	44.480	44.460	44.457	0.15
45.0	44.9	44.9	44.958	44.971	44.983	44.965	44.966	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.051	0.025	2
45.0	0.047	0.032	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 %.

-o0o-



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Email: ccc-sm@agilent.com
Website: www.agilent.com/chem

Customer Contact:

ALS Laboratory Group (Thailand) Co
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd
Khwaeng Phatthanakan Khet Suan
TAX ID : 0105540004859
supakwan.mak@alsglobal.com
087-622-7264

Invoice To:

ALS Laboratory Group (Thailand) Co
Ltd Head Office

104 Phatthanakan 40 Phatthanakan Rd
Khwaeng Phatthanakan Khet Suan

Delivery Site:

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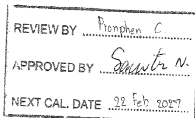
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Bangkok 10500 Thailand
Tax ID : 0105540004859

Citibank N.A. Bangkok Branch
389 Interchange 21 Building, Sukhumvit Road, Klongtoey New
Sub-district, Wattana District, Bangkok 10110 Thailand
Acc. No: 012 4452 007
THE Kung Thai Bank PCL
Siam Square Bldg, 416/7-12 Rama 1 Rd, Pathumwan, BKK 10330
Thailand

SERVICE REPORT

Customer Purchase Order Number:	Customer Number:
	70371013
Service Request:	Service Request Date:
Service Order:	Service Confirmation:
6008258477	6906892140

**Direct Inquiries to:**

Contact Name: Customer Contact Center
Contact E-mail: ccc-sm@agilent.com
Contact Telephone: +662 637 6363
Contact Fax: +662 632 4334

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-ID-5100	ICP-OES 5100/5110 System			
G8010A	Agilent 5100 SVDV ICP-OES Spectrometer	MY16010005	ICP OES 5100	SYS-ID-5100
G8410A	SPS 4 Autosampler	AU15440764	ICP OES 5100	SYS-ID-5100

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EQI	Enterprise Operational Qualification	1.00	Agreement Entitlement 100 % covered	23.02.2026	23.02.2026
1010	6610030100	Bottle ICP-OES Wavecal soln 500mL 5 ppm	1.00	Agreement Entitlement 100 % covered		
1020	5198-7001	Calibration blank solution Spet HNO3	1.00	Agreement Entitlement 100 % covered		

Additional Information:

Service Confirmation Number: 6906892140

Service Confirmation Date: 23.02.2026

Service Information:

Problem Description: IT-EDU-ID-5100-5001541158		
-Perform OQ Hardware completed. -Instrument ID: ICPOES-BKK_EL0037. -Instrument Tests are all Passed.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 2.5	Travel Hours: 1.5	
Customer Field Service Representative Name: Uthai Ngamlersirichai	Customer Field Service Representative Signature: 	Date: 23 Feb 2026
Customer Name: Praphen Chokson	Customer Signature: 	Date: 23 Feb 2026
Additional Comments:		

**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. T250355

Page 1 of 6

Certificate of Calibration

Equipment : HEATING BLOCK
Manufacturer : Environmental Express
Model : SC 196
Serial No. : 6974CECW3285
Customer Code : BKK_EL0054
ID No. : T5306A3
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250

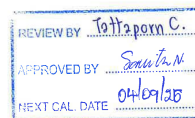
Customer Location : Acid Digestion Lab

Date of Receipt : 26 February 2025

Calibrated By : Atiphong Rongrat (Technician)

Approved By : / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 17 MAR 2025



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.



Metrological Center

SCI ECO Services Company Limited

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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. T250355

Page 2 of 6

Calibration Report

Equipment : HEATING BLOCK
Date of Calibration : 4 March 2025
Environment : Temperature : 24.4-24.9 °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 its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-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 Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN221-TN230	T240712	19 April 2025
TC	TYPE T	TN231-TN240	T240712	19 April 2025
TC	TYPE T	TN241-TN250	T240401	16 March 2025
TC	TYPE T	TN251-TN260	T240401	16 March 2025
DATA LOGGER	34970A	T193	T240401	16 March 2025

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 2 Hour 40 Minute At 95 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By,

FM-L13 108/30-05-57



Metrological Center

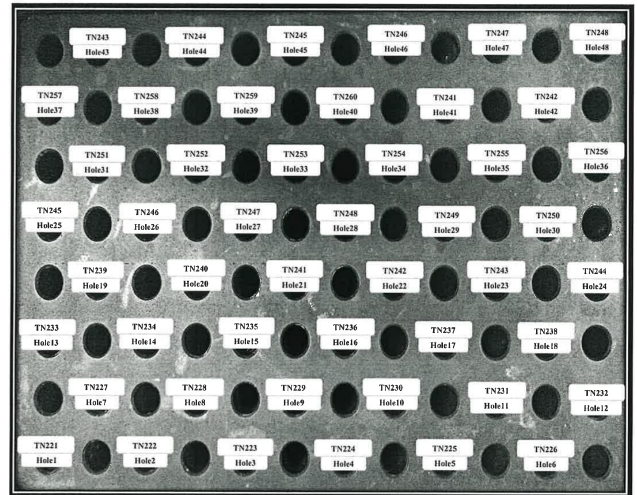
SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhohi, 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. T250355

Page 3 of 6

Calibration Report



FRONT CONTROL

Approved By,

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhohi, 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. T250355

Page 4 of 6

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	94.85	95.37	95.03	95.25	95.32
	Min	94.17	94.66	94.38	94.63	94.87
	Average	94.51	95.02	94.70	94.94	95.20
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	94.71	94.56	94.79	95.32	95.44
	Min	94.05	93.88	94.10	94.65	94.90
	Average	94.38	94.22	94.44	94.99	95.17
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	95.26	95.43	95.40	95.71	95.41
	Min	94.54	94.64	94.71	95.10	94.86
	Average	94.90	95.03	95.06	95.41	95.13
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	95.13	95.06	95.68	96.16	95.35
	Min	94.39	94.43	94.86	95.51	94.88
	Average	94.76	94.75	95.27	95.83	95.12
R5 Hole25-Hole30	TN245	TN246	TN247	TN248	TN249	TN250
	Max	94.95	95.81	95.39	95.82	95.66
	Min	94.47	95.03	94.67	94.99	94.84
	Average	94.71	95.42	95.03	95.41	95.25
R6 Hole31-Hole36	TN251	TN252	TN253	TN254	TN255	TN256
	Max	96.07	95.34	96.28	95.39	94.95
	Min	95.28	94.55	95.51	94.62	94.13
	Average	95.67	94.95	95.90	95.00	94.54
R7 Hole37-Hole42	TN257	TN258	TN259	TN260	TN241	TN242
	Max	95.15	95.63	96.11	95.09	95.34
	Min	94.38	94.88	95.32	94.28	94.54
	Average	94.76	95.25	95.71	94.69	94.94
R8 Hole43-Hole48	TN243	TN244	TN245	TN246	TN247	TN248
	Max	95.84	95.87	95.44	95.72	95.65
	Min	95.06	95.10	94.60	94.95	94.87
	Average	95.45	95.48	95.02	95.34	95.26

Approved By,

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhohi, 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. T250355

Page 5 of 6

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	104.48	104.40	104.60	105.27	105.24
	Min	104.15	104.02	104.25	104.94	104.91
	Average	104.32	104.21	104.42	105.10	105.08
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	105.20	105.45	105.58	105.96	105.81
	Min	104.92	105.14	105.29	105.64	105.53
	Average	105.06	105.29	105.43	105.80	105.67
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	106.09	106.14	105.83	106.25	105.97
	Min	105.80	105.89	105.37	106.00	105.69
	Average	105.94	106.01	105.70	106.13	105.83
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	105.87	105.75	105.30	105.07	105.22
	Min	105.62	105.52	105.13	104.90	105.05
	Average	105.74	105.63	105.21	104.98	105.14
R5 Hole25-Hole30	TN245	TN246	TN247	TN248	TN249	TN250
	Max	105.62	105.54	105.32	105.75	105.97
	Min	105.45	105.35	105.31	105.57	105.81
	Average	105.53	105.44	105.41	105.66	105.89
R6 Hole31-Hole36	TN251	TN252	TN253	TN254	TN255	TN256
	Max	106.19	106.34	106.47	105.96	105.76
	Min	106.02	106.16	106.31	105.77	105.58
	Average	106.10	106.25	106.39	105.87	105.67
R7 Hole37-Hole42	TN257	TN258	TN259	TN260	TN241	TN242
	Max	106.21	105.59	105.45	105.36	106.08
	Min	106.04	105.42	105.28	105.20	105.90
	Average	106.12	105.51	105.37	105.28	105.99
R8 Hole43-Hole48	TN243	TN244	TN245	TN246	TN247	TN248
	Max	106.54	106.33	105.78	105.38	105.42
	Min	106.38	106.16	105.60	105.20	105.25
	Average	106.46	106.25	105.69	105.29	105.33

Approved By,

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhroi, 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. T250355

Page 6 of 6

Calibration Report

Measurement Results:

Setting (°C)	HEATING BLOCK		Temperature Distribution	
	Reading (°C)		Stability (± °C)	Uncertainty (± °C)
	Min, Max	Average		
102.0	-	102.0	0.43	0.83
107.0	-	107.0	0.20	0.70

* 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: _____

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 : Laboratory Room

Date of Receipt : 28 May 2025

Calibrated By : Atiphong Rongrat (Technician)

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

Date of Issue : 19 JUN 2025

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-L13 108/30-05-57

FM-TL06 102/27-03-68



Metrology Center

SCI ECO Services Company Limited

51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18250



Certificate No. T250873

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)
Date of Calibration : 4 June 2025
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	TN91-TN100	T242036	3 December 2025
TC	TYPE T	TN101-TN110	T242036	3 December 2025
DATA LOGGER	34970A	T121	T242036	3 December 2025

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 2 Hour 20 Minute At 3 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

Approved By: _____



Metrology Center

SCI ECO Services Company Limited

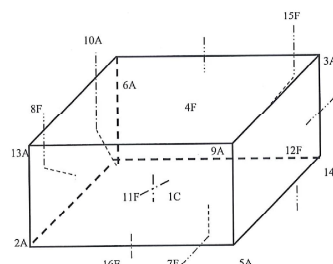
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18250



Certificate No. T250873

Page 3 of 4

Calibration Report



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

1C = TN91	12F = TN102
2A = TN92	13A = TN103
3A = TN93	14A = TN104
4F = TN94	15F = TN105
5A = TN95	16E = TN106
6A = TN96	
7F = TN97	
8F = TN98	
9A = TN99	
10A = TN100	
11F = TN101	

Approved By: _____

FM-TL07 102/27-03-68

FM-TL07 102/27-03-68



Certificate No. T250873

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100	TN101	TN102
3.0	2.95	2.92	3.09	2.92	3.16	3.50	3.40	3.03	3.14	2.98	3.44	3.13
	TN103	TN104	TN105	TN106								
	3.19	3.06	3.46	2.92								

Chamber (Cooling Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min , Max	Average					
3.0	2.8, 3.9	3.4	3.14	1.20	1.30	1.90	2.04

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-TL07 102/27-03-68

BKK_EL0128



Performance Verification Certificate for Mercury Analyzer

PRODUCT ID Quicktrace M-8000 , Teledyne Leeman Labs

Equipment ID BKK_EL0128 Mercury Analyzer

S/N: US22133002

BKK_EL0129 Autosampler

S/N: 052222A560

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

Address 104 Soi Pattana 40, Pattana Rd. Suan Luang, Suan Luang Bangkok 10250 Thailand

Date of Qualified

November 27, 2025

Next Due date

November 27, 2026

This certifies for products which was performed in acceptable criteria specifications

Autosampler & Sample Introduction

PASSED

Analyzer

PASSED

Gas Liquid Separator & Dryer

PASSED

CVAFS Detector

PASSED

Electronics/Mechanical

PASSED

Data station/PC

PASSED

Analytical test

PASSED

Provided by

Scientist Instrument Co., Ltd.
113 Soi Ekachai 44, Ekachai Road
Khlong Bang Phran, Bangbon
Bangkok 10150 Thailand

Certified by 

Thunraphol Sakdayos

Service Engineer

Model : DR3900
Serial No. : 2021559
ID No. : BKK_EN0356
Condition As-Received: Used Item
Received Date : 08 October 2025
Calibration Date : 08 October 2025
Reference : 2510-0042OC-11
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Calibration Place : Wet Chemistry Lab 2
Ambient Temperature : (21.9 to 21.9) °C (On-Site)
Relative Humidity : (62 to 65) % (On-Site)
Calibration Procedure : In - house method :
CP-0CH4 based on ASTM E 275-08
Calibrated by : Uthen Kankawi
Approved by : 
() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Salthip Meangmai
Issue Date : 9 October 2025

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.



Cert. No. : 25CHO537

Page : 2 of 3

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	44487	122584	31 May 2026
2. Wavelength Standard set	36730	118120	15 Jan 2026
3. Wavelength Standard set	36730	118121	15 Jan 2026

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

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

- Starna Scientific Ltd.

4. Spectral BandWidth : 5 nm
Scan Speed : - nm/min

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (± nm)	Coverage Factor k
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	513	0.59	2.00
537.00	536	0.59	2.00
638.00	638	0.59	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00



Cert. No.: 25CHO537
Page: 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor k
420.0	Zero	0.000	0.0028	2.00
	0.5750	0.573	0.0028	2.00
	0.7156	0.713	0.0028	2.00
	1.0176	1.014	0.0028	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5598	0.557	0.0028	2.00
	0.7037	0.700	0.0028	2.00
	1.0013	0.997	0.0028	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5222	0.522	0.0028	2.00
	0.6646	0.664	0.0028	2.00
	0.9444	0.945	0.0028	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5234	0.523	0.0028	2.00
	0.7007	0.700	0.0028	2.00
	0.9992	0.999	0.0028	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5573	0.556	0.0028	2.00
	0.7760	0.773	0.0028	2.00
	1.1104	1.108	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5648	0.565	0.0028	2.00
	0.7654	0.765	0.0028	2.00
	1.0961	1.096	0.0028	2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- 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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 25CH1162
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Hach
Model : HQ411d
Serial No. : 200100031163
ID No. : BKK_EN0342
Condition As-Received: Used Item
Received Date : 08 October 2025
Calibration Date : 09 October 2025
Reference : 2510-0271DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirithean

Approved by :
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 10 October 2025

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.



Cert.No.: 25CH1162
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Ref. Standard Thermometer	4982054	110RC044	251708	03 July 2026

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1114384	12 June 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1135355	16 Aug 2026

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

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.: 252063043080	4.007	3.996	176.6	0.0046	2.00
	6.965	6.974	1.1	0.0084	2.00
	10.010	9.996	-176.9	0.0070	2.00

Remark : - Can not connect the BNC because the plug does not match with the socket.



Cert.No.: 25CH1162
Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(°) Without adjustment

This equipment was connected with Temperature Probe;

- Model :	PHC281
- Serial No. :	252063043080
Dimension of probe	
- Length :	103 mm.
- Diameter :	12 mm.
- Immersion Depth :	90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.001	25.0	-0.001	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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