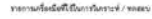


ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



รายงานผลวิจัยเบื้องต้นในการวิจัยทางเคมี / พลเอกสน



ภาคการเกษตรมีอยู่ในภาพลักษณ์ / ๒๕๕๖

ANALYZER CALIBRATION DATA

Lot No. 2417223-1

Lot No. 2417229-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

CEMs Data

[illegible]



EMISSION TEST RESULT

Client	Sam Polyethylene Co., Ltd.	Run #	2
Date	17 Sep 24	Location	Furnace 1
Start Time	11:01	Test Operator	Bathaporn T.
NO _x Analyzer Model	TELEDYNE API 3005H	Serial No.	775
CO Analyzer Model	TELEDYNE API 3005H	Serial No.	625

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:01	4.58	0.16	11.37	-	2.03	
11:02	4.69	0.62	11.67	-	2.05	
11:03	4.69	0.61	11.88	-	2.02	
11:04	4.59	0.55	11.67	-	2.05	
11:05	4.77	0.67	11.88	-	2.12	
11:06	4.55	0.60	11.67	-	2.10	
11:07	4.62	0.65	11.68	-	2.18	
11:08	4.91	0.75	11.71	-	2.05	
11:09	5.10	0.70	11.75	-	2.08	
11:10	4.78	0.70	11.75	-	2.07	
11:11	4.48	0.68	11.69	-	1.85	
11:12	4.61	0.75	11.75	-	1.72	
11:13	4.89	0.71	11.71	-	2.24	
11:14	5.12	0.40	11.81	-	3.14	
11:15	5.20	0.50	11.70	-	3.12	
11:16	4.69	0.70	11.67	-	2.22	
11:17	4.48	0.88	11.71	-	1.30	
11:18	4.75	0.70	11.84	-	1.88	
11:19	5.10	0.45	11.77	-	3.18	
11:20	5.07	0.48	11.75	-	3.11	
11:21	4.83	0.58	11.71	-	2.25	
Average	4.81	0.66	11.71	-	2.03	

Sathaporn T.

(Mr. Sathaporn Thakorn)

Environmental Field Scientist (E)

FORM NO. P-04-001 REVISION NO. 1 ISSUE DATE: 18/01/2019
ALS Laboratory Group



EMISSION TEST RESULT

Client	Sam Polyethylene Co., Ltd.	Run #	3
Date	17 Sep 24	Location	Furnace 1
Start Time	11:42	Test Operator	Bathaporn T.
NO _x Analyzer Model	TELEDYNE API 3005H	Serial No.	775
CO Analyzer Model	TELEDYNE API 3005H	Serial No.	625

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
11:42	5.05	0.48	11.75	-	2.52	
11:43	5.28	0.33	11.88	-	2.92	
11:44	5.32	0.44	11.88	-	2.93	
11:45	5.17	0.55	11.92	-	2.93	
11:46	5.08	0.48	11.90	-	2.70	
11:47	5.25	0.48	11.78	-	4.11	
11:48	5.29	0.29	11.88	-	4.04	
11:49	5.06	0.45	11.72	-	2.35	
11:50	5.05	0.50	11.77	-	2.30	
11:51	5.23	0.44	11.82	-	6.74	
11:52	5.58	0.47	11.84	-	6.10	
11:53	4.85	0.67	11.50	-	2.18	
11:54	4.87	0.68	11.55	-	2.43	
11:55	5.35	0.27	11.85	-	6.38	
11:56	5.19	0.33	11.58	-	4.77	
11:57	4.92	0.62	11.57	-	2.00	
11:58	4.85	0.64	11.50	-	1.89	
11:59	5.05	0.50	11.74	-	2.70	
12:00	5.05	0.50	11.78	-	4.66	
12:01	5.21	0.30	11.70	-	4.00	
12:02	4.82	0.63	11.78	-	2.47	
Average	5.11	0.48	11.72	-	3.43	

Sathaporn T.

(Mr. Sathaporn Thakorn)

Environmental Field Scientist (E)

FORM NO. P-04-001 REVISION NO. 1 ISSUE DATE: 18/01/2019
ALS Laboratory Group



Lot No. 2417225-1

ANALYZER CALIBRATION DATA

Client	Sam Polyethylene Co., Ltd.	Location	Furnace 2
Date	17 Sep 24	Test Operator	Sakul P.
O ₂ ANALYZER	TELEDYNE API 3005	Serial No.	81
Span (%)	25		

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
ZERO GAS	0.00	0.00	0.00	0.00
LOW-LEVEL GAS	6.00	6.00	6.00	0.00
HIGH GAS	15.00	15.00	15.00	0.16

NO _x ANALYZER	HORIBA PG-500	Serial No.	TD08RGP
Model	PG-500		
Span (ppm)	200		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
ZERO GAS	0.00	0.00	0.00	0.00
LOW-LEVEL GAS	60.00	60.00	60.00	0.00
HIGH GAS	194.40	194.40	194.40	0.00

CO ANALYZER	HORIBA PG-500	Serial No.	TD08RGP
Model	PG-500		
Span (ppm)	500		

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
ZERO GAS	0.00	0.00	0.00	0.00
LOW-LEVEL GAS	125.00	125.00	125.00	0.00
HIGH GAS	475.00	475.00	475.00	0.00

Calibrated by

Sakul P.

(Mr. Sakul Phaisangthout)

Environmental Field Scientist (E)

FORM NO. P-04-001 REVISION NO. 1 ISSUE DATE: 18/01/2019
ALS Laboratory Group



Lot No. 2417225-1

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	Sam Polyethylene Co., Ltd.	Location	Furnace 2
Date	17 Sep 24	Test Operator	Sakul P.
O ₂ ANALYZER	TELEDYNE API 3005	Serial No.	81
Cylinder Conc. (%)	15.00	Span (%)	25

	Initial Values	Final Values	Drift
O ₂ Analyzer Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response
Zero Gas	0.00	0.00	0.00
Low-Level Gas	15.00	15.00	0.16

NO _x ANALYZER	Model	Span (ppm)	200
Cylinder Conc. (ppm)	154.40		

	Initial Values	Final Values	Drift
NO _x Analyzer Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response
Zero Gas	0.00	0.00	0.00
Low-Level Gas	154.40	154.40	0.00

CO ANALYZER	Model	Span (ppm)	500
Cylinder Conc. (ppm)	407.40		

	Initial Values	Final Values	Drift
CO Analyzer Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response
Zero Gas	0.00	0.00	0.00
Low-Level Gas	407.40	407.40	0.00

Calibrated by

Sakul P.

(Mr. Sakul Phaisangthout)

Environmental Field Scientist (E)



CEMs Data

Client	Sam Polyethylene Co., Ltd.	Date	17 Sep 24
Plant Name	Sam Polyethylene Co., Ltd.	Location	Furnace 2

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
17:00:00	4.58	0.16	11.37	-	2.03	
17:00:01	4.69	0.62	11.67	-	2.05	
17:00:02	4.69	0.61	11.88	-	2.02	
17:00:03	4.59	0.55	11.67	-	2.05	
17:00:04	4.77	0.67	11.88	-	2.12	
17:00:05	4.55	0.60	11.67	-	2.10	
17:00:06	4.62	0.65	11.68	-	2.18	
17:00:07	4.91	0.75	11.71	-	2.05	
17:00:08	5.10	0.70	11.75	-	2.08	
17:00:09	4.78	0.70	11.75	-	2.07	
17:00:10	4.48	0.68	11.69	-	1.85	
17:00:11	4.61	0.75	11.75	-	1.72	
17:00:12	4.89	0.71	11.71	-	2.24	
17:00:13	5.12	0.40	11.81	-	3.14	
17:00:14	5.20	0.50	11.70	-	3.12	
17:00:15	4.69	0.70	11.67	-	2.22	
17:00:16	4.48	0.88	11.71	-	1.30	
17:00:17	4.75	0.70	11.84	-	1.88	
17:00:18	5.10	0.45	11.77	-	3.18	
17:00:19	5.07	0.48	11.75	-	3.11	
17:00:20	4.83	0.58	11.71	-	2.25	
Average	4.81	0.66	11.71	-	2.03	

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
17:00:21	4.58	0.16	11.37	-	2.03	
17:00:22	4.69	0.62	11.67	-	2.05	
17:00:23	4.69	0.61	11.88	-	2.02	
17:00:24	4.59	0.55	11.67	-	2.05	
17:00:25	4.77	0.67	11.88	-	2.12	
17:00:26	4.55	0.60	11.67	-	2.10	
17:00:27	4.62	0.65	11.68	-	2.18	
17:00:28	4.91	0.75	11.71	-	2.05	
17:00:29	5.10	0.70	11.75	-	2.08	
17:00:30	4.78	0.70	11.75	-	2.07	
17:00:31	4.48	0.68	11.69	-	1.85	
17:00:32	4.61	0.75	11.75	-	1.72	
17:00:33	4.89	0.71	11.71	-	2.24	
17:00:34	5.12	0.40	11.81	-	3.14	
17:00:35	5.20	0.50	11.70	-	3.12	
17:00:36	4.69	0.70	11.67	-	2.22	
17:00:37	4.48	0.88	11.71	-	1.30	
17:00:38	4.75	0.70	11.84	-	1.88	
17:00:39	5.10	0.45	11.77	-	3.18	
17:00:40	5.07	0.48	11.75	-	3.11	
17:00:41	4.83	0.58	11.71	-	2.25	
Average	4.81	0.66	11.71	-	2.03	

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
17:00:42	4.58	0.16	11.37	-	2.03	
17:00:43	4.69	0.62	11.67	-	2.05	
17:00:44	4.69	0.61	11.88	-	2.02	
17:00:45	4.59	0.55	11.67	-	2.05	
17:00:46	4.77	0.67	11.88	-	2.12	
17:00:47	4.55	0.60	11.67	-	2.10	
17:00:48	4.62	0.65	11.68	-	2.18	
17:00:49	4.91	0.75	11.71	-	2.05	
17:00:50	5.10	0.70	11.75	-	2.08	
17:00:51	4.78	0.70	11.75	-	2.07	
17:00:52	4.48	0.68	11.69	-	1.85	
17:00:53	4.61	0.75	11.75	-	1.72	
17:00:54	4.89	0.71	11.71	-	2.24	
17:00:55	5.12	0.40	11.81	-	3.14	
17:00:56	5.20	0.50	11.70	-	3.12	
17:00:57	4.69	0.70	11.67	-	2.22	
17:00:58	4.48	0.88	11.71	-	1.30	
17:00:59	4.75	0.70	11.84	-	1.88	
17:01:00	5.10	0.45	11.77	-	3.18	
17:01:01	5.07	0.48	11.75	-	3.11	
17:01:02	4.83	0.58	11.71	-	2.25	
Average	4.81	0.66	11.71	-	2.03	



CEMs Data

Client	Sam Polyethylene Co., Ltd.	Date	17 Sep 24
Plant Name	Sam Polyethylene Co., Ltd.	Location	Furnace 2

Time (min)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO ₂ (ppm)	CO (ppm)	Remark
17:01:03	4.58	0.16	11.37	-	2.03	
17:01:04	4.69	0.62	11.67	-	2.05	
17:01:05	4.69	0.61	11.88	-	2.02	
17:01:06	4.59	0.55	11.67	-	2.05	
17:01:07	4.77	0.67	11.88	-	2.12	
17:01:08	4.55	0.60	11.67	-	2.10	
17:01:09	4.62	0.65	11.68	-	2.18	
17:01:10	4.91	0.75	11.71	-	2.05	
17:01:11	5.10	0.70	11.75	-	2.08	
17:01:12	4.78	0.70	11.75	-	2.07	
17:01:13	4.48	0.68	11.69	-	1.85	
17:01:14	4.58	0.65	11.67	-	1.85	
17:01:15	4.58	0.65	11.67	-	1.85	
17:01:16	4.58	0.65	11.67	-	1.85	
17:01:17	4.58	0.65	11.67	-	1.85	
17:01:18	4.58	0.65	11.67	-	1.85	
17:01:19	4.58	0.65	11.67	-	1.85	
17:01:20	4.58	0.65	11.67	-	1.85	
17:01:21	4.58	0.65	11.67	-	1.85	
17:01:22	4.58	0.65	11.67	-	1.85	
17:01:23	4.58	0.65	11.67	-	1.85	
17:01:24	4.58	0.65	11.67	-	1.85	
17:01:25	4.58	0.65	11.67	-	1.85	
17:01:26	4.58	0.65	11.67	-	1.85	
17:01:27	4.58	0.65	11.67	-	1.85	
17:01:28	4.58	0.65	11.67	-	1.85	
17:01:29	4.58	0.65	11.67	-	1.85	
17:01:30	4.58	0.65	11.67	-	1.85	
17:01:31	4.58	0.65	11.67	-	1.85	
17:01:32	4.58	0.65	11.67	-	1.85	
17:01:33	4.58	0.65	11.67	-	1.85	
17:01:34	4.58	0.65	11.67	-	1.85	
17:01:35	4.58	0.65	11.67	-	1.85	
17:01:36	4.58	0.65	11.67	-	1.85	
17:01:37	4.58	0.65	11.67	-	1.85	
17:01:38	4.58	0.65	11.67	-	1.85	
17:01:39	4.58	0.65	11.67	-	1.85	
17:01:40	4.58	0.65	11.67	-	1.85	
17:01:41	4.58	0.65	11.67	-	1.85	
17:01:42	4.58	0.65	11.67	-	1.85	
17:01:43	4.58	0.65	11.67	-	1.85	
17:01:44	4.58	0.65	11.67	-	1.85	
17:01:45	4.58	0.65	11.67	-	1.85	
17:01:46	4.58	0.65	11.67	-	1.85	
17:01:47	4.58	0.65	11.67	-	1.85	
17:01:48	4.58	0.65	11.67	-	1.85	
17:01:49	4.58	0.65	11.67	-	1.85	
17:01:50	4.58	0.65	11.67	-	1.85	
17:01:51	4.58	0.65	11.67	-	1.85	
17:01:52	4.58	0.65	11.67	-	1.85	
17:01:53	4.58	0.65	11.67	-	1.85	
17:01:54	4.58	0.65	11.67	-	1.85	
17:01:55	4.58	0.65	11.67	-	1.85	
17:01:56	4.58	0.65	11.67	-	1.85	
17:01:57	4.58	0.65	11.67	-	1.85	
17:01:58	4.58	0.65	11.67	-	1.85	
17:01:59	4.58	0.65	11.67	-	1.85	
17:02:00	4.58	0.65	11.67	-	1.85	
17:02:01	4.58	0.65	11.67	-	1.85	
17:02:02	4.58	0.65	11.67	-	1.85	
17:02:03	4.58	0.65	11.67	-	1.85	
17:02:04	4.58	0.65	11.67	-	1.85	
17:02:05	4.58	0.65	11.67	-	1.85	
17:02:06	4.58	0.65	11.67	-	1.85	
17:02:07	4.58	0.65	11.67	-	1.85	
17:02:08	4.58	0.65	11.67	-	1.85	
17:02:09	4.58	0.65	11.67	-	1.85	
17:02:10	4.58	0.65	11.67	-	1.85	
17:02:11	4.58	0.65	11.67	-	1.85	
17:02:12	4.58	0.65	11.67	-	1.85	
17:02:13	4.58	0.65	11.67	-	1.85	
17:02:14	4.58	0.65	11.67	-	1.85	
17:02:15	4.58	0.65	11.67	-	1.85	
17:02:16	4.58	0.65	11.67	-	1.85	
17:02:17	4.58	0.65	11.67	-	1.85	
17:02:18	4.58	0.65	11.67	-	1.85	
17:02:19	4.58	0.65	11.67	-	1.85	
17:02:20	4.58	0.65	11.67	-	1.85	
17:02:21	4.58	0.65	11.67	-	1.85	
17:02:22	4.58	0.65	11.67	-	1.85	
17:02:23	4.58	0.65	11.67	-	1.85	
17:02:24	4.58	0.65	11.67	-	1.85	
17:02:25	4.58	0.65	11.67	-	1.85	
17:02:26	4.58	0.65	11.67	-	1.85	
17:02:27	4.58	0.65	11.67	-	1.85	
17:02:28	4.58	0.65	11.67	-	1.85	
17:02:29	4.58	0.65	11.67	-	1.85	
17:02:30	4.58	0.65	11.67	-	1.85	
17:02:31	4.58	0.65	11.67	-	1.85	
17:02:32	4.58	0.65	11.67	-	1.85	
17:02:33	4.58	0.65	11.67	-	1.85	
17:02:34	4.58	0.65	11.67	-	1.85	
17:02:35	4.58	0.65	11.67	-	1.85	
17:02:36	4.58	0.65	11.67	-	1.85	
17:02:37	4.58	0.65	11.67	-	1.85	
17:02:38	4.58	0.65	11.67	-	1.85	
17:02:39	4.58	0.65	11.67	-	1.85	
17:02:40	4.58	0.65	11.67	-	1.85	
17:02:41	4.58	0.65	11.67	-	1.85	
17:02:42	4.58	0.65	11.67	-	1.85	
17:02:43	4.58	0.65	11.67	-	1.85	
17:02:44	4.58	0.65	11.67	-	1.85	
17:02:45	4.58	0.65	11.67	-	1.85	
17:02:46	4.58	0.65	11.67	-	1.85	
17:02:47	4.58	0.65	11.67	-	1.85	
17:02:48	4.58	0.65	11.67	-	1.85	
17:02:49	4.58	0.65	11.67	-	1.85	
17:02:50	4.58	0.65	11.67	-	1.85	
17:02:51	4.58	0.65	11.67	-	1.85	
17:02:52	4.58	0.65	11.67	-	1.85	
17:02:53	4.58	0.65	11.67	-	1.85	
17:02:54	4.58	0.65	11.67	-	1.85	
17:02:55	4.58	0.65	11.67	-	1.85	
17:02:56	4.58	0.65	11.67	-	1.85	
17:02:57	4.58	0.65	11.67	-	1.85	
17:02:58	4.58	0.65	11.67	-	1.85	
17:02:59	4.58	0.65	11.67	-	1.85	
17:03:00	4.58	0.65	11.67	-	1.85	
17:03:01	4.58	0.65	11.67	-	1.85	
17:03:02	4.58	0.65	11.67	-	1.85	
17:03:03	4.58	0.65	11.67	-	1.85	
17:03:04	4.58	0.65	11.67	-	1.85	
17:03:05	4.58	0.65	11.67	-	1.85	
17:03:06	4.58	0.65	11.67	-	1.85	
17:03:07	4.58	0.65	11.67	-	1.85	
17:03:08	4.58	0.65	11.67	-	1.85	
17:03:09	4.58	0.65	11.67	-	1.85	
17:03:10	4.58	0.65	11.67	-	1.85	
17:03:11	4.58	0.65	11.67	-	1.85	
17:03:12	4.58	0.65	11.67	-	1.85	
17:03:13	4.58	0.65	11.67	-	1.85	
17:03:14	4.58	0.65	11.67	-	1.85	
17:03:15	4.58	0.65	11.67	-	1.85	
17:03:16	4.58	0.65	11.67	-	1.85	
17:03:17	4.58	0.65	11.67	-	1.85	
17:03:18	4.58	0.65	11.67	-	1.85	
17:03:19	4.58	0.65	11.67	-	1.85	
17:03:20	4.58	0.65	11.67	-	1.85	
17:03:21	4.58	0.65	11.67	-	1.85	
17:03:22	4.58	0.65	11.67	-	1.85	
17:03:23	4.58	0.65	11.67	-	1.85	
17:03:24	4.58	0.65	11.67	-	1.85	
17:03:25	4.58	0.65	11.67	-	1.85	
17:03:26	4.58	0.65	11.67	-	1.85	
17:03:27	4.58	0.65	11.67	-	1.85	
17:03:28	4.58	0.65	11.67	-	1.85	
17:03:29	4.58	0.65	11.67	-	1.85	
17:03:30	4.58	0.65	11.67	-	1.85	
17:03:31	4.58	0.65	11.67	-	1.85	
17:03:32	4.58	0.65	11.67	-	1.85	
17:03:33	4.58	0.65	11.67	-	1.85	
17:03:34	4.58	0.65	11.67	-	1.85	
17:03:35	4.58	0.65	11.67	-	1.85	
17:03:36	4.58	0.65	11.67	-	1.85	
17:03:37	4.58	0.65	11.67	-	1.85	
17:03:38	4.58	0.65	11.67	-	1.85	
17:03:39	4.58	0.65	11.67	-	1.85	
17:03:40	4.58	0.65	11.67	-	1.85	
17:03:41	4.58	0.65	11.67	-	1.85	
17:03:42	4.58	0.65	11.67	-	1.85	
17:03:43	4.58	0.65	11.67	-	1.85	
17:03:44	4.58	0.65	11.67	-	1.85	
17:03:45	4.58	0.65	11.67	-	1.85	
17:03:46	4.58	0.65	11.67	-	1.85	
17:03:47	4.58	0.65	11.67	-	1.85	
17:03:48	4.58	0.65	11.67	-	1.85	
17:03:49	4.58	0.65	11.67	-	1.85	
17:03:50	4.58	0.65	11.67	-	1.85	
17:03:51	4.58	0.65	11.67	-	1.85	
17:03:52	4.58	0.65	11.67	-	1.85	
17:03:53	4.58	0.65	11.67	-	1.85	
17:03:54	4.58	0.65	11.67	-	1.85	
17:03:55	4.58	0.65	11.67	-	1.85	
17:03:56	4.58	0.65	11.67	-	1.85	
17:03:57	4.58	0.65	11.67	-	1.85	
17:03:58	4.58	0.65	11.67	-	1.85	
17:03:59	4.58	0.65	11.67	-	1.85	
17:04:00	4.58	0.65	11.67	-	1.85	
17:04:01	4.58	0.65	11.67	-	1.85	
17:04:02	4.58	0.65	11.67	-	1.85	
17:04:03	4.58	0.65	11.67	-	1.85	
17:04:04	4.58	0.65	11.67	-	1.85	
17:04:05	4.58	0.65	11.67	-	1.85	
17:04:06	4.58	0.65	11.67	-	1.85	
17:04:07	4.58	0.65	11.67	-	1.85	
17:04:08	4.58	0.65	11.67	-	1.85	
17:04:09	4.58	0.65	11.67	-	1.85	
17:04:10	4.58	0.65	11.67	-	1.85	
17:04:11	4.58	0.65	11.67	-	1.85	
17:04:12	4.58	0.65	11.67	-	1.85	
17:04:13	4.58	0.65	11.67	-	1.85	
17:04:14	4.58	0.65	11.67	-	1.85	
17:04:15	4.58	0.65	11.67	-	1.85	
17:04:16	4.58	0.65	11.67	-	1.85	
17:04:17	4.58	0.65	11.67	-	1.85	
17:04:18						



EMISSION TEST RESULT

Client	Sam Polyethylene Co., Ltd.	Run #	3
Date	17 Sep 24	Location	Parame 2
Site	1722	Test Operator	Sakot P.
SO _x Analyser Model	TELEOM AP 300EM	Result No.	---
NO _x Analyser Model	TELEOM AP 300EM	Serial No.	---
CO/CO ₂ Analyser Model	TELEOM AP 300EM	Serial No.	451

Time (sec)	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	SO _x (ppm)	CO (ppm)	Remark
11:20	9.97	8.97	13.41	---	132.07	
11:21	9.98	8.95	13.73	---	130.76	
11:24	9.93	8.78	13.60	---	140.49	
11:25	9.98	8.78	13.59	---	129.18	
11:26	9.97	8.65	13.61	---	134.26	
11:27	9.97	8.95	13.76	---	139.83	
11:28	9.99	8.92	13.93	---	144.66	
11:29	9.98	8.78	14.05	---	139.45	
11:30	9.92	8.85	14.51	---	114.60	
11:31	9.96	8.97	13.72	---	129.83	
11:32	9.97	8.76	13.68	---	139.41	
11:33	9.98	8.82	14.03	---	130.37	
11:34	9.85	8.83	14.01	---	121.41	
11:35	9.95	8.88	13.84	---	124.14	
11:36	9.91	8.84	13.62	---	133.80	
11:37	9.97	8.83	13.84	---	132.80	
11:38	9.92	8.87	13.88	---	129.93	
11:39	9.96	8.65	13.89	---	126.37	
11:40	9.92	8.62	13.87	---	136.94	
11:41	9.95	8.78	13.93	---	136.41	
11:42	9.91	8.78	13.91	---	125.77	
Average	9.96	8.81	13.80	---	129.56	

Sakot P.

(B. Sakot Phrasmitra)

Environmental Field Scientist (E)

FORM E-1 (REV. 01) - 01/01/2019

ALS Laboratory (UK)



CEMs Data

Client Name	Sam Polyethylene Co., Ltd.	Location	Parame 2
Plant Name	Sam Polyethylene Co., Ltd.	Run No. 1	Run No. 2
Run No. 1	Run No. 2	Run No. 3	Run No. 4
Date	Time	Parameter	Value
11/20/2024	11:20	SO ₂ (ppm)	13.41
11/20/2024	11:21	SO ₂ (ppm)	13.73
11/20/2024	11:24	SO ₂ (ppm)	13.60
11/20/2024	11:25	SO ₂ (ppm)	13.59
11/20/2024	11:26	SO ₂ (ppm)	13.61
11/20/2024	11:27	SO ₂ (ppm)	13.76
11/20/2024	11:28	SO ₂ (ppm)	13.93
11/20/2024	11:29	SO ₂ (ppm)	14.05
11/20/2024	11:30	SO ₂ (ppm)	14.51
11/20/2024	11:31	SO ₂ (ppm)	13.72
11/20/2024	11:32	SO ₂ (ppm)	13.68
11/20/2024	11:33	SO ₂ (ppm)	14.03
11/20/2024	11:34	SO ₂ (ppm)	14.01
11/20/2024	11:35	SO ₂ (ppm)	13.84
11/20/2024	11:36	SO ₂ (ppm)	13.62
11/20/2024	11:37	SO ₂ (ppm)	13.84
11/20/2024	11:38	SO ₂ (ppm)	13.88
11/20/2024	11:39	SO ₂ (ppm)	13.89
11/20/2024	11:40	SO ₂ (ppm)	13.87
11/20/2024	11:41	SO ₂ (ppm)	13.93
11/20/2024	11:42	SO ₂ (ppm)	13.91
Average		SO ₂ (ppm)	13.80



CEMs Data

Client Name	Sam Polyethylene Co., Ltd.	Location	Parame 2
Plant Name	Sam Polyethylene Co., Ltd.	Run No. 1	Run No. 2
Run No. 1	Run No. 2	Run No. 3	Run No. 4
Date	Time	Parameter	Value
11/20/2024	11:20	SO ₂ (ppm)	13.41
11/20/2024	11:21	SO ₂ (ppm)	13.73
11/20/2024	11:24	SO ₂ (ppm)	13.60
11/20/2024	11:25	SO ₂ (ppm)	13.59
11/20/2024	11:26	SO ₂ (ppm)	13.61
11/20/2024	11:27	SO ₂ (ppm)	13.76
11/20/2024	11:28	SO ₂ (ppm)	13.93
11/20/2024	11:29	SO ₂ (ppm)	14.05
11/20/2024	11:30	SO ₂ (ppm)	14.51
11/20/2024	11:31	SO ₂ (ppm)	13.72
11/20/2024	11:32	SO ₂ (ppm)	13.68
11/20/2024	11:33	SO ₂ (ppm)	14.03
11/20/2024	11:34	SO ₂ (ppm)	14.01
11/20/2024	11:35	SO ₂ (ppm)	13.84
11/20/2024	11:36	SO ₂ (ppm)	13.62
11/20/2024	11:37	SO ₂ (ppm)	13.84
11/20/2024	11:38	SO ₂ (ppm)	13.88
11/20/2024	11:39	SO ₂ (ppm)	13.89
11/20/2024	11:40	SO ₂ (ppm)	13.87
11/20/2024	11:41	SO ₂ (ppm)	13.93
11/20/2024	11:42	SO ₂ (ppm)	13.91
Average		SO ₂ (ppm)	13.80



CEMs Data

Client Name	Sam Polyethylene Co., Ltd.	Location	Parame 2
Plant Name	Sam Polyethylene Co., Ltd.	Run No. 1	Run No. 2
Run No. 1	Run No. 2	Run No. 3	Run No. 4
Date	Time	Parameter	Value
11/20/2024	11:20	SO ₂ (ppm)	13.41
11/20/2024	11:21	SO ₂ (ppm)	13.73
11/20/2024	11:24	SO ₂ (ppm)	13.60
11/20/2024	11:25	SO ₂ (ppm)	13.59
11/20/2024	11:26	SO ₂ (ppm)	13.61
11/20/2024	11:27	SO ₂ (ppm)	13.76
11/20/2024	11:28	SO ₂ (ppm)	13.93
11/20/2024	11:29	SO ₂ (ppm)	14.05
11/20/2024	11:30	SO ₂ (ppm)	14.51
11/20/2024	11:31	SO ₂ (ppm)	13.72
11/20/2024	11:32	SO ₂ (ppm)	13.68
11/20/2024	11:33	SO ₂ (ppm)	14.03
11/20/2024	11:34	SO ₂ (ppm)	14.01
11/20/2024	11:35	SO ₂ (ppm)	13.84
11/20/2024	11:36	SO ₂ (ppm)	13.62
11/20/2024	11:37	SO ₂ (ppm)	13.84
11/20/2024	11:38	SO ₂ (ppm)	13.88
11/20/2024	11:39	SO ₂ (ppm)	13.89
11/20/2024	11:40	SO ₂ (ppm)	13.87
11/20/2024	11:41	SO ₂ (ppm)	13.93
11/20/2024	11:42	SO ₂ (ppm)	13.91
Average		SO ₂ (ppm)	13.80



CEMs Data

Client Name	Sam Polyethylene Co., Ltd.	Location	Parame 2
Plant Name	Sam Polyethylene Co., Ltd.	Run No. 1	Run No. 2
Run No. 1	Run No. 2	Run No. 3	Run No. 4
Date	Time	Parameter	Value
11/20/2024	11:20	SO ₂ (ppm)	13.41
11/20/2024	11:21	SO ₂ (ppm)	13.73
11/20/2024	11:24	SO ₂ (ppm)	13.60
11/20/2024	11:25	SO ₂ (ppm)	13.59
11/20/2024	11:26	SO ₂ (ppm)	13.61
11/20/2024	11:27	SO ₂ (ppm)	13.76
11/20/2024	11:28	SO ₂ (ppm)	13.93
11/20/2024	11:29	SO ₂ (ppm)	14.05
11/20/2024	11:30	SO ₂ (ppm)	14.51
11/20/2024	11:31	SO ₂ (ppm)	13.72
11/20/2024	11:32	SO ₂ (ppm)	13.68
11/20/2024	11:33	SO ₂ (ppm)	14.03
11/20/2024	11:34	SO ₂ (ppm)	14.01
11/20/2024	11:35	SO ₂ (ppm)	13.84
11/20/2024	11:36	SO ₂ (ppm)	13.62
11/20/2024	11:37	SO ₂ (ppm)	13.84
11/20/2024	11:38	SO ₂ (ppm)	13.88
11/20/2024	11:39	SO ₂ (ppm)	13.89
11/20/2024	11:40	SO ₂ (ppm)	13.87
11/20/2024	11:41	SO ₂ (ppm)	13.93
11/20/2024	11:42	SO ₂ (ppm)	13.91
Average		SO ₂ (ppm)	13.80



CEMs Data

Client Name	Sam Polyethylene Co., Ltd.	Location	Parame 2
Plant Name	Sam Polyethylene Co., Ltd.	Run No. 1	Run No. 2
Run No. 1	Run No. 2	Run No. 3	Run No. 4
Date	Time	Parameter	Value
11/20/2024	11:20	SO ₂ (ppm)	13.41
11/20/2024	11:21	SO ₂ (ppm)	13.73
11/20/2024	11:24	SO ₂ (ppm)	13.60
11/20/2024	11:25	SO ₂ (ppm)	13.59
11/20/2024	11:26	SO ₂ (ppm)	13.61
11/20/2024	11:27	SO ₂ (ppm)	13.76
11/20/2024	11:28	SO ₂ (ppm)	13.93
11/20/2024	11:29	SO ₂ (ppm)	14.05
11/20/2024	11:30	SO ₂ (ppm)	14.51
11/20/2024	11:31	SO ₂ (ppm)	13.72
11/20/2024	11:32	SO ₂ (ppm)	13.68
11/20/2024	11:33	SO ₂ (ppm)	14.03
11/20/2024	11:34	SO ₂ (ppm)	14.01
11/20/2024	11:35	SO ₂ (ppm)	13.84
11/20/2024	11:36	SO ₂ (ppm)	13.62
11/20/2024	11:37	SO ₂ (ppm)	13.84
11/20/2024	11:38	SO ₂ (ppm)	13.88
11/20/2024	11:39	SO ₂ (ppm)	13.89
11/20/2024	11:40	SO ₂ (ppm)	13.87
11/20/2024	11:41	SO ₂ (ppm)	13.93
11/20/2024	11:42	SO ₂ (ppm)	13.91
Average		SO ₂ (ppm)	13.80



Type S Pitot Tube Calibration

Date Calibration 10-Jul-24
Pitot ID BKK_FS0472
Due Date 10-Jan-25
Inclinometer ID BKK_FS1131
Vernier ID RYG_FS0539

Parameter	Value	Allowable Range	Check
α_1	-5.1	$-10^\circ < \alpha_1 < +10^\circ$	OK
α_2	6.7	$-10^\circ < \alpha_2 < +10^\circ$	OK
β_1	2.0	$-5^\circ < \beta_1 < +5^\circ$	OK
β_2	-4.2	$-5^\circ < \beta_2 < +5^\circ$	OK
γ	3.7	-	-
θ	0.2	-	-
$Z = A \tan \gamma$	0.038	$Z \leq 0.125^\circ$	OK
$W = A \tan \theta$	0.003	$W \leq 0.031^\circ$	OK
Dt	0.30	0.188° to 0.375°	OK
A/2Dt	1.50	$1.05 \leq A/2Dt \leq 1.5$	OK
A	0.9	$2.10t \leq A \leq 3Dt$	OK

Certify that pitot tube/probe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

Calibrated by: Saksit Phiangphut
[Mr. Saksit Phiangphut]
RYG Field Services Scientist (4)
Approved by: Nattapon Jangreewong
[Mr. Nattapon Jangreewong]
RYG Field Services Specialist (1)

FORM NO.: F-06-124 REVISION NO.: 0 ISSUE DATE: 2/12/23



Type S Pitot Tube Calibration

Date Calibration 10-Jul-24
Pitot ID RYG_FS0320
Due Date 10-Jan-25
Inclinometer ID BKK_FS1131
Vernier ID RYG_FS0539

Parameter	Value	Allowable Range	Check
α_1	0.5	$-10^\circ < \alpha_1 < +10^\circ$	OK
α_2	1.5	$-10^\circ < \alpha_2 < +10^\circ$	OK
β_1	-2.2	$-5^\circ < \beta_1 < +5^\circ$	OK
β_2	-0.6	$-5^\circ < \beta_2 < +5^\circ$	OK
γ	-1.2	-	-
θ	-1.4	-	-
$Z = A \tan \gamma$	-0.018	$Z \leq 0.125^\circ$	OK
$W = A \tan \theta$	0.021	$W \leq 0.031^\circ$	OK
Dt	0.310	0.188° to 0.375°	OK
A/2Dt	1.403	$1.05 \leq A/2Dt \leq 1.5$	OK
A	0.87	$2.10t \leq A \leq 3Dt$	OK

Certify that pitot tube/probe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

Calibrated by: Saksit Phiangphut
[Mr. Saksit Phiangphut]
RYG Field Services Scientist (4)
Approved by: Nattapon Jangreewong
[Mr. Nattapon Jangreewong]
RYG Field Services Specialist (1)

FORM NO.: F-06-124 REVISION NO.: 0 ISSUE DATE: 2/12/23



DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date 10-Jul-24
Need Calibration Date 10-Jan-25
Barometric Pressure (mmHg) 756.2
Relative Humidity (%) 56.2
Temperature (°C) 26.7
Dry Gas Meter ID: C-090124-RYG_FS0317
Reference Dry Gas Meter ID: BKK_FS1132
Dry Gas Meter ID: RYG_FS0317
Serial No: 170603
Correction Factor (Y) 0.9824
Model No: XC-42-CV
Need Calibration Date: 7/4/2024

Reference Dry Gas Meter Calibration				Dry Gas Meter				Dry Gas Meter Correction Factor	
V (L/min)				V (L/min)				Avg. Tr (Y)	
Flow	Inlet	Temp (°C)	Tr	Flow	Inlet	Temp (°C)	Tr	Avg. Tr (Y)	Factor
30.00	0.00	30.00	26.0	30.01	0.00	30.01	26.0	27.0	0.9827
30.00	0.00	30.00	26.0	30.01	0.00	30.01	26.0	27.0	0.9827
60.00	0.00	30.00	26.0	60.00	0.00	60.00	26.0	27.0	0.9832
60.00	0.00	30.00	26.0	60.00	0.00	60.00	26.0	27.0	0.9832
90.00	0.00	30.00	26.0	90.00	0.00	90.00	26.0	27.0	0.9838
90.00	0.00	30.00	26.0	90.00	0.00	90.00	26.0	27.0	0.9838
									Avg 0.9838

Y = Ratio of reading of reference dry gas meter to dry gas meter; Interval for individual ± 0.001 from average.

Calibrated by: Saksit Phiangphut
[Mr. Saksit Phiangphut]
RYG Field Services Scientist (4)
Approved by: Nattapon Jangreewong
[Mr. Nattapon Jangreewong]
RYG Field Services Specialist (1)

FORM NO.: F-06-124 REVISION NO.: 0 ISSUE DATE: 2/12/23



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date 10 Jul 24		Ambient Temperature (°C) 26.7			
Calibration sheet No.: C-100724-RYG_FS0317		Relative Humidity (%) 56.2			
Digital Temperature ID: RYG_FS0317		Reference Temperature ID: RYG_FS0581			
Serial No.: 170603		Serial No.: 20100014918			
Model: XC-42-CV		Model: Dgson-CC-V1-M6			
		Next Calibrate: 13 Nov 24			
Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Block	0	0	0	±0.5	Pass
	25	25	0	±0.5	Pass
	50	50	0	±0.5	Pass
	100	100	0	±0.5	Pass
	150	150	0	±0.5	Pass
	200	200	0	±0.5	Pass
	250	251	1	±0.5	Pass
	300	301	1	±0.5	Pass
Probe	500	501	1	±0.5	Pass
	100	101	1	±0.5	Pass
	120	121	1	±0.5	Pass
	140	141	1	±0.5	Pass
Over	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
Filter	100	101	1	±0.5	Pass
	120	121	1	±0.5	Pass
	140	141	1	±0.5	Pass
	0	0	0	±0.5	Pass
Ext	10	10	0	±0.5	Pass
	20	20	0	±0.5	Pass
	0	0	0	±0.5	Pass
Meter	20	25	0	±0.5	Pass
	25	25	0	±0.5	Pass
	50	50	0	±0.5	Pass
ALX	0	1	1	±0.5	Pass
	25	26	1	±0.5	Pass
	50	51	1	±0.5	Pass

MPE: (Maximum permissible error of measurement) in (°C) is (value) as per (value) as per (value)

Calibrated by: Saksit Phiangphut
[Mr. Saksit Phiangphut]
RYG Field Services Scientist (4)
Approved by: Nattapon Jangreewong
[Mr. Nattapon Jangreewong]
RYG Field Services Specialist (1)

FORM NO.: F-06-124 REVISION NO.: 0 ISSUE DATE: 10/2/23



CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date 10-Jul-24		Need Cal. Date 10-Jan-25		Barometric Pressure (mmHg) 756.2		Relative Humidity (%) 56.2		Temperature (°C) 26.7		Reference Dry Gas Meter ID: RYG_FS0317		Serial No: 170603		Model No: XC-42-CV		Need Calibration Date: 7-Nov-24	
Calibration of Date 10-Jul-24		Need Cal. Date 10-Jan-25		Barometric Pressure (mmHg) 756.2		Relative Humidity (%) 56.2		Temperature (°C) 26.7		Reference Dry Gas Meter ID: RYG_FS0317		Serial No: 170603		Model No: XC-42-CV		Need Calibration Date: 7-Nov-24	
Calibration of Date 10-Jul-24		Need Cal. Date 10-Jan-25		Barometric Pressure (mmHg) 756.2		Relative Humidity (%) 56.2		Temperature (°C) 26.7		Reference Dry Gas Meter ID: RYG_FS0317		Serial No: 170603		Model No: XC-42-CV		Need Calibration Date: 7-Nov-24	
Calibration of Date 10-Jul-24		Need Cal. Date 10-Jan-25		Barometric Pressure (mmHg) 756.2		Relative Humidity (%) 56.2		Temperature (°C) 26.7		Reference Dry Gas Meter ID: RYG_FS0317		Serial No: 170603		Model No: XC-42-CV		Need Calibration Date: 7-Nov-24	
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DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date	10 Jul 24	Ambient Temperature (°C)	33.8		
Calibration sheet No.	C-100724-BKK_F50489	Relative Humidity (%)	46.2		
Digital Temperature ID	BKK_F50489	Reference Temperature ID	RVLG_F50881		
Serial No.	130005	Serial No.	2010001418		
Model	XC-572-V	Model	Diptron-CO-VT-M5		
Next Calibrate		13 Nov 24			
Location	Reference Temperature (°C)	Digital Temperature (°C)	Error (°C)	MPE	Pass / Fail
Block	0	0	0	±0.3	Pass
	25	25	0	±0.3	Pass
	50	50	0	±0.3	Pass
	100	101	1	±0.3	Pass
	150	150	0	±0.3	Pass
Probe	200	201	1	±0.3	Pass
	250	251	1	±0.3	Pass
	300	301	1	±0.3	Pass
	350	351	1	±0.3	Pass
	400	401	1	±0.3	Pass
Open	100	101	1	±0.3	Pass
	120	121	1	±0.3	Pass
	140	141	1	±0.3	Pass
	160	161	1	±0.3	Pass
	180	181	1	±0.3	Pass
Filter	120	121	1	±0.3	Pass
	140	141	1	±0.3	Pass
	160	161	1	±0.3	Pass
	180	181	1	±0.3	Pass
	200	201	1	±0.3	Pass
Exit	0	0	0	±0.3	Pass
	10	10	0	±0.3	Pass
	20	20	0	±0.3	Pass
	30	30	0	±0.3	Pass
	40	40	0	±0.3	Pass
Meter	0	0	0	±0.3	Pass
	25	25	0	±0.3	Pass
	50	49	-1	±0.3	Pass
	75	75	0	±0.3	Pass
	100	100	0	±0.3	Pass
ALUX	0	0	0	±0.3	Pass
	25	25	0	±0.3	Pass
	50	50	0	±0.3	Pass
	75	75	0	±0.3	Pass
	100	100	0	±0.3	Pass

MPE: (Maximum permissible error of measurement) $\pm 0.3^\circ\text{C}$ for $T \leq 100^\circ\text{C}$ and $\pm 0.5^\circ\text{C}$ for $T > 100^\circ\text{C}$

Calibrated by: Saksit Phrasamphol Approved by: Nattaporn Jangwong
 (Mr. Saksit Phrasamphol) (Mr. Nattaporn Jangwong)
 (RVLG Field Service Specialist) (RVLG Field Service Specialist)

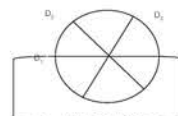
FORM NO. F-50-021 REVISION NO. 3 ISSUE DATE: 10/2023



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date	10 Jul 24	Nozzle Set ID	BKK_F50474		
Calibration Sheet No.	C-100724-BKK_F50474	Verifier Caliber ID	BKK_F51123		
Nozzle ID #	Nozzle Diameter (mm)			H - L ₀ ΔD	(L ₀ + L ₁) / 2 D _{avg}
	D ₁	D ₂	D ₃		
1	0.300	0.300	0.300	0.000	0.303
2	0.450	0.450	0.450	0.000	0.450
3	0.604	0.602	0.601	0.003	0.602
4	0.760	0.765	0.770	0.010	0.765
5	0.925	0.945	0.905	0.010	0.938
6	1.095	1.090	1.092	0.000	1.095
7	1.260	1.260	1.260	0.000	1.260
8	1.600	1.600	1.610	0.010	1.605

Where:
 D_1, D_2, D_3 = Three different nozzle diameters in 90° degrees to each other, each measured to the nearest 0.025 mm.
 ΔD = Maximum difference between any two diameters, must be ≤ 0.030 mm.
 D_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by: Saksit Phrasamphol Approved by: Nattaporn Jangwong
 (Mr. Saksit Phrasamphol) (Mr. Nattaporn Jangwong)
 (RVLG Field Service Specialist) (RVLG Field Service Specialist)

FORM NO. F-50-021 REVISION NO. 3 ISSUE DATE: 10/2023



Calibration Certificate

Certificate No.: G-670176
 Date of issue : 09-Mar-24



Instrument description : Flue Gas Analyzer
 Instrument model : Testo 350 New
 Control unit serial no. : 03040401119
 Instrument serial no. : 62007041119
 ID no. or control no. : RVLG_F50464
 Manufacturer : Testo SE & Co. KGaA

Probe description : -
 Probe model : -
 Probe serial no. : -
 Customer name : ALS LABORATORY GROUP (THAILAND) CO., LTD.
 Customer address : 104 Phatthanakorn Rd., Phatthanakorn Road, Khwaeng Phatthanakorn, Khwaeng San Luang, Bangkok, 10500 Thailand

Total pages of certificate : 3 Pages
 Receiving no. : L-240095
 Receiving date : 04-Mar-24
 Parameter of calibration : Gas Calibration (Oxygen 2.50, 10.0, 21.0, 30.0 % vol, Carbon Monoxide 80.14, 302.100, 1000 ppm, Nitrogen Dioxide 30.34, 81.32, 201.9 ppm, Nitric Oxide 30.81, 151.5, 322.5 ppm, Sulfur Dioxide 30.34, 100.8, 600.8 ppm)

Condition of UUC : Unit
 Ambient condition : All of the Measurement were carried out the stabilized laboratory
 Temperature : $23 \pm 0.5^\circ\text{C}$
 Humidity : $55 \pm 15\%$ RH

Calibration place : 17/121 Soi Ngamwongwan 47 Yuen 48, Thungwongthani, Laksi, Bangkok 10210

Calibration procedure no. : This instrument was calibrated by comparison with Standard Gas mixture according to calibration Work Instruction no. W5-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test and environmental conditions. This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal are not valid and the results relate only to the items tested/calibrated. This calibration certificate documents are traceable to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 08-Mar-24

Mr. Kuanthak Khamsung Calibration Technician
 Mr. Nongkook Wongsatien Technical Manager

ENTECH Industrial Solution Co., Ltd.
 17-121 Soi Ngamwongwan 47 Yuen 48, Thungwongthani, Laksi, Bangkok 10210 THAILAND Tel: 0-2779-8888 Call center 02-050-0501
 Fax: 0-21050303501 www.entech.co.th



Calibration Certificate

Certificate No.: G-670176

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Unit	24-Aug-27
Oxygen (O ₂) 10.00 % Vol	CG-0137-23	Nent	18-Nov-26
Oxygen (O ₂) 21.00 % Vol	CG-0640-23	Nent	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0940-22	Nent	14-Feb-27
Carbon monoxide (CO) 302.1 ppm	2191/23	Unit	10-Jun-25
Carbon monoxide (CO) 1000 ppm	2094/23	Unit	10-Sep-25
Nitrogen Dioxide (NO ₂) 30.34 ppm	2703/22	Unit	22-Aug-24
Nitrogen Dioxide (NO ₂) 81.32 ppm	1546/23	Unit	14-Jun-26
Nitrogen Dioxide (NO ₂) 201.9 ppm	1870/23	Unit	17-Jun-25
Nitric Oxide (NO) 30.81 ppm	CG-0814-23	Unit	19-Feb-25
Nitric Oxide (NO) 151.5 ppm	0561/23	Unit	22-Jun-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Unit	17-Jun-25
Sulfur Dioxide (SO ₂) 100.8 ppm	2004/23	Unit	17-Jun-25
Sulfur Dioxide (SO ₂) 600.8 ppm	1360/22	Unit	09-Nov-24
Sulfur Dioxide (SO ₂) 1000 ppm	2003/23	Unit	17-Jun-25

Measured mean conditions: Temperature : 23.6°C Humidity : 65.3% RH Pressure : 1013.2 mbar

Calibration conditions: Gas Temperature : 23°C Flow rate : 1,200 ml/min Gas pressure : 1013.2 mbar

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (1x)
O ₂ (%Vol)	2.50	2.45	-0.05	0.15
O ₂ (%Vol)	10.04	9.93	-0.11	0.20
O ₂ (%Vol)	21.02	21.39	0.38	0.30
CO (ppm)	80.14	81	0.86	3.0
CO (ppm)	302	305	3	6.0
CO (ppm)	1003	1009	6	12
NO ₂ (ppm)	30.34	24.2	-6.14	8.8
NO ₂ (ppm)	81.32	76.9	-4.42	8.0
NO ₂ (ppm)	201.9	188.7	-13.2	12
NO (ppm)	30.81	27	-3.81	8.0
NO (ppm)	151.5	144	-7.5	8.0
NO (ppm)	322.5	304	-18.5	12
SO ₂ (ppm)	100.8	98	-2.8	6.0
SO ₂ (ppm)	1000.8	997	-3.8	12

FORM CL-09-C Rev.3 Page 1 of 3 Issue Date 26/05/25

Entech Industrial Solution Co., Ltd.
 17-121 Soi Ngamwongwan 47 Yuen 48, Thungwongthani, Laksi, Bangkok 10210 THAILAND Tel: 0-2779-8888 Call center 02-050-0501
 Fax: 0-21050303501 www.entech.co.th



Calibration Certificate

Certificate No.: G-670176

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (1x)
O ₂ (%Vol)	2.500	2.45	-0.05	0.15
O ₂ (%Vol)	10.04	9.93	-0.11	0.20
O ₂ (%Vol)	21.02	21.39	0.38	0.30
CO (ppm)	80.14	81	0.86	3.0
CO (ppm)	302	305	3	6.0
CO (ppm)	1003	1009	6	12
NO ₂ (ppm)	30.34	26.5	-3.84	8.0
NO ₂ (ppm)	81.32	82.4	1.08	8.0
NO ₂ (ppm)	201.9	203.4	1.5	12
NO (ppm)	30.81	29	-1.81	8.0
NO (ppm)	151.5	152	0.5	8.0
NO (ppm)	322.5	321	-1.5	12
SO ₂ (ppm)	100.8	98	-2.8	6.0
SO ₂ (ppm)	1000.8	997	-3.8	12

Remark : 1. coverage = 1.96, 2. ppm/100 = 1.00%

End of Report

FORM CL-09-C Rev.3 Page 1 of 3 Issue Date 26/05/25

Entech Industrial Solution Co., Ltd.
 17-121 Soi Ngamwongwan 47 Yuen 48, Thungwongthani, Laksi, Bangkok 10210 THAILAND Tel: 0-2779-8888 Call center 02-050-0501
 Fax: 0-21050303501 www.entech.co.th



Calibration Certificate

Certificate No.: G-670124
 Date of issue : 22-Feb-24



Instrument description : Flue Gas Analyzer
 Instrument model : Testo 340
 Control unit serial no. : -
 Instrument serial no. : 42150085
 ID no. or control no. : RVLG_F50465
 Manufacturer : Testo SE & Co. KGaA

Probe description : -
 Probe model : -
 Probe serial no. : -
 Customer name : ALS LABORATORY GROUP (THAILAND) CO., LTD.
 Customer address : 104 Phatthanakorn Rd., Phatthanakorn Road, Khwaeng Phatthanakorn, Khwaeng San Luang, Bangkok, 10500 Thailand

Total pages of certificate : 2 Pages
 Receiving no. : L-240094
 Receiving date : 19-Feb-24
 Parameter of calibration : Gas Calibration (Oxygen 2.50, 10.0, 21.0, 30.0 % vol, Carbon Monoxide 80.14, 302.100, 1000 ppm, Nitric Oxide 30.81, 151.5, 322.5 ppm, Sulfur Dioxide 30.34, 100.8, 600.8 ppm)

Condition of UUC : Unit
 Ambient condition : All of the Measurement were carried out the stabilized laboratory
 Temperature : $23 \pm 0.5^\circ\text{C}$
 Humidity : $55 \pm 15\%$ RH

Calibration place : 17/121 Soi Ngamwongwan 47 Yuen 48, Thungwongthani, Laksi, Bangkok 10210

Calibration procedure no. : This instrument was calibrated by comparison with Standard Gas mixture according to calibration Work Instruction no. W5-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test and environmental conditions. This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal are not valid and the results relate only to the items tested/calibrated. This calibration certificate documents are traceable to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 22-Feb-24

Mr. Kuanthak Khamsung Calibration Technician
 Mr. Nongkook Wongsatien Technical Manager

Entech Industrial Solution Co., Ltd.
 17-121 Soi Ngamwongwan 47 Yuen 48, Thungwongthani, Laksi, Bangkok 10210 THAILAND Tel: 0-2779-8888 Call center 02-050-0501
 Fax: 0-21050303501 www.entech.co.th

Certificate No : 24-AFM-033
Request No : Req-2024-0201

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
23.50	101.26	26	19.965	6.6	1.3
24.20	101.25	101	100.30	-0.5	2.8
24.00	101.23	200	199.13	-0.9	5.6
23.80	101.42	301	303.36	2.6	8.4
24.10	101.41	401	404.37	4	11
24.10	101.49	400	403.81	-3.8	7.9

Note: STD = Standard UUC = Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation:

$$Q_{mean} = Q_{ref} \times \frac{P_{ref}}{P} \times \frac{T_{amb}}{T_{ref}}$$

where: Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Mean = Measurement Condition ref = Standard Condition

* Indicates non-accepted

End of Certificate

Certificate of Calibration

Certificate No : 24-AFM-032
Request No : Req-2024-0200

Customer : ALX Laboratory Group Thailand Co., Ltd.
Name :
Address : 104 Soi Phatthanaburi 40, Phatthanaburi Road, Soei Uong, Bangkok
10250

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator
Manufacturer : Binn
Model : Defender F10-M
Serial Number : 029508
ID : BYO-F10209
Location of Calibration : LAB-A AIR VELOCITY METER

Serial Model :
Serial Number :

Calibration Environment and Details

Temperature : 23.5 °C ± 1 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013.3 kPa ± 10 kPa
Received Date : 11 January 2024
Calibration Date : 13 February 2024



Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceability	Due Calibration
Air Flow Meter	Gillibrator 3 Low flow	18101010006	Standard	12 July 2024
Air Flow Meter	Gillibrator 3 Standard flow	19031011003	Standard	12 July 2024
Temperature meter	QT 11	00000007	Quinton	27 February 2024
Pressure meter	CPG2400	41000000/001002	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Standardized AZLA Accreditation No. 1943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibration By :
Mr. Suphachai Jongsang
Service Calibration Engineer

Approved By :
Mr. Pichit Mahaveera
Calibration Engineer Supervisor
Issue Date : 13 February 2024

Certificate No : 24-AFM-032
Request No : Req-2024-0200

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
23.80	101.49	95	100.13	5.1	2.8
23.80	101.71	201	213.93	12.9	7.2
24.18	101.62	1006	1019.3	13	14
24.00	101.83	1997	2023.0	26	29
24.10	101.87	2990	3015.5	17	45
24.00	102.00	1944	1991.8	48	39
24.00	102.08	4738	4790.3	52	72

Note: STD = Standard UUC = Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation:

$$Q_{mean} = Q_{ref} \times \frac{P_{ref}}{P} \times \frac{T_{amb}}{T_{ref}}$$

where: Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Mean = Measurement Condition ref = Standard Condition

* Indicates non-accepted

End of Certificate

Certificate of Calibration

Certificate No : 24-AFM-174
Request No : Req-2024-1861

Customer : ALX Laboratory Group Thailand Co., Ltd.
Name :
Address : 104 Soi Phatthanaburi 40, Phatthanaburi Road, Soei Uong, Bangkok 10250

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mettler
Model : F10-M
Serial Number : 200147
ID : BRM-FS147
Location of Calibration : LAB-A AIR VELOCITY METER

Accuracy : 1% of Reading

Serial Number :
Serial Number :

Calibration Environment and Details

Temperature : 23.5 °C ± 1 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013.3 kPa ± 10 kPa
Received Date : 22 August 2024
Calibration Date : 28 August 2024

REVIEW BY: *Handwritten signature*
APPROVED BY: *Handwritten signature*
NEXT CAL DATE: 28/8/25

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceability	Due Calibration
Air Flow Meter	Gillibrator 3 Low flow	18101010006	Standard	9 August 2024
Air Flow Meter	Gillibrator 3 Standard flow	19031011003	Standard	2 August 2025
Temperature meter	QT 11	00000007	Quinton	1 March 2023
Pressure meter	CPG2400	41000000/001002	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Standardized AZLA Accreditation No. 1943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibration By :
Mr. Suphachai Jongsang
Service Calibration Engineer

Approved By :
Mr. Pichit Mahaveera
Calibration Engineer Supervisor
Issue Date : 28 August 2024

Certificate No : 24-AFM-174
Request No : Req-2024-1861

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.30	100.57	100	99.526	-0.5	2.8	1	N/A
22.40	100.61	499	500.49	1.5	7.8	5	N/A
22.50	100.56	1004	1004.8	1	17	10	N/A
22.60	100.54	2009	2003.3	-5.7	29	30	N/A
22.80	100.62	3034	3032.1	-2	45	30	N/A
23.20	100.71	4032	4022.4	-9.6	68	40	N/A
23.40	100.71	5068	5056.4	-12	79	51	N/A

Note: STD = Standard UUC = Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation:

$$Q_{mean} = Q_{ref} \times \frac{P_{ref}}{P} \times \frac{T_{amb}}{T_{ref}}$$

where: Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Mean = Measurement Condition ref = Standard Condition

* Indicates non-accepted

MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)

N/A = Not Available, Customer does not require a statement of conformity

Certificate No : 24-AFM-174
Request No : Req-2024-1861

Decision Rule for Statements of Conformity

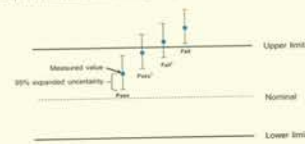
The standard decision rule applied for the statement of conformity in each calibration result will be applied using IEC 61360:2019 Guidelines on the Reporting of Compliance with Specification in following Fig. and summary:

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

Fail - The measurement result is within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail - The measurement result was one 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 was outside the limit.



End of Certificate

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CALIBRATION LAB HEAD OFFICE
7/10 MOO 11, BANGKOK INDUSTRIAL PARK, BANGKOK
ADDRESS: BANGKOK INDUSTRIAL PARK, BANGKOK
TEL: 02-010-1000 FAX: 02-010-1000

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Certificate of Calibration

Certificate No: 24-AFM-177
Request No: Req-2024-1862

Customer: ALS Laboratory Group Thailand Co., Ltd.
Name: 104 Soi Phatthanasak 40, Phatthanasak Road, Sam Long
Address: Bangkok 10250

Unit Under Calibration Details

Measurement Item: Air Flow Meter
Manufacturer: Bux
Model: Defender F10-L
Serial Number: 138024
ID: BKK_F10019

Location of Calibration: LAB 4 AIR VELOCITY METER
Calibration Environment and Details

Temperature: 23.7°C ± 0.3°C
Humidity: 55.54RH ± 0.54RH
Barometric Pressure: 1013.3 hPa ± 0.1 hPa
Received Date: 22 August 2024
Calibration Date: 9 September 2024
Calibration Procedure: In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 3 Low flow	1850101-0008	Secondary	9 August 2025
Air Flow Meter	Calibrator 3 Standard flow	1903101-0003	Secondary	3 August 2025
Temperature meter	UT 11	00000077	Quartz	1 March 2025
Pressure meter	CP52400	41000000-001002	TPA	9 November 2024

Traceability

This Certificate is traceable to SI Unit through Secondary A2LA Accredited No. 1840.01

Notes

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %

Calibration By: Mr. Nopadol Lamsat
Mr. Nopadol Lamsat
Service Calibration Engineer

Approved By: Mr. Patch Mahayoon
Mr. Patch Mahayoon
Calibration Engineer Supervisor

Issue Date: 9 September 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.
INV-200-AFM-01 Rev-04 Issue date 17/05/24

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CALIBRATION LAB HEAD OFFICE
7/10 MOO 11, BANGKOK INDUSTRIAL PARK, BANGKOK
ADDRESS: BANGKOK INDUSTRIAL PARK, BANGKOK
TEL: 02-010-1000 FAX: 02-010-1000

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Certificate of Calibration

Certificate No: 24-AFM-177
Request No: Req-2024-1862

Result of Calibration - Without Adjustment

Temperature	Pressure	STD	UUC	Error	Uncertainty	MPE	Result
(°C)	(kPa)	(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	
24.70	100.92	29	20.192	0.2	1.3	0.2	N/A
24.70	100.90	100	99.923	-0.1	2.8	1.8	N/A
24.70	100.94	201	200.7	-0.3	5.6	3.6	N/A
24.70	100.97	298	298.1	0.1	8.4	5.4	N/A
24.70	100.99	403	399.1	-4	11	8.8	N/A
24.80	101.05	412	417.6	-4.4	6.9	6.9	N/A

Note

STD - Standard UUC - Unit Under Calibration
UUC Reference Condition - At atmospheric pressure and room temperature condition
(Flow rate corrected for non-standard operating conditions by using equation)

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where: Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates not included

MPE = Maximum Permissible Error (Specified in Manufacturer's Specification)
N/A = Not Available, Customer does not require a statement of conformity

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.
INV-200-AFM-01 Rev-04 Issue date 17/05/24

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CALIBRATION LAB HEAD OFFICE
7/10 MOO 11, BANGKOK INDUSTRIAL PARK, BANGKOK
ADDRESS: BANGKOK INDUSTRIAL PARK, BANGKOK
TEL: 02-010-1000 FAX: 02-010-1000

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ANAB

Certificate of Calibration

Certificate No: 24-AFM-177
Request No: Req-2024-1862

Decision Rule for Statements of Conformity

The standard decision rule employed for the uncertainty of conforming to each calibration result will be applied using ILAC G8:2019 Guidelines on the Reporting of Conformity with Specification in following Fig. and statement

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

Fail - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement is 95% outside the limit.

Not - The measurement result was outside the limit. However, a portion of the expanded uncertainty of measurement is 95% within the limit.

Not - The measurement result plus the expanded uncertainty with a 95% coverage probability was outside the limit.

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.
INV-200-AFM-01 Rev-04 Issue date 17/05/24



ROTA METER CALIBRATION RESULT JULY 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_F50577	01 Jul 24	Y = 1.0001x + 0.0433	1.0000
BKK_F50584	01 Jul 24	Y = 1.0006x + 2.7974	1.0000
BKK_F50585	02 Jul 24	Y = 1.0315x + 3.0033	0.9999
BKK_F50587	02 Jul 24	Y = 1.0294x + 0.71	1.0000
BKK_F50588	01 Jul 24	Y = 0.9751x + 9.8402	0.9999
BKK_F50591	01 Jul 24	Y = 1.0035x + 6.2303	1.0000
BKK_F50592	02 Jul 24	Y = 1.002x + 14.273	1.0000
BKK_F50594	02 Jul 24	Y = 1.0003x + 7.0095	1.0000
BKK_F50595	01 Jul 24	Y = 1.0871x + 114.97	0.9995
BKK_F51004	02 Jul 24	Y = 0.9826x + 13.51	0.9999
BKK_F51005	02 Jul 24	Y = 1.0217x - 0.5633	0.9997
BKK_F51006	02 Jul 24	Y = 1.149x - 1.0422	0.9981
BKK_F51007	02 Jul 24	Y = 1.1116x + 3.3556	0.9994
BKK_F51008	02 Jul 24	Y = 1.1273x + 0.4837	0.9999
BKK_F51009	01 Jul 24	Y = 1.1044x - 0.8245	1.0000
BKK_F51017	02 Jul 24	Y = 1.0489x + 2.2027	0.9998
BKK_F51018	02 Jul 24	Y = 1.0173x - 0.1957	0.9999
BKK_F51019	02 Jul 24	Y = 1.0022x + 5.619	1.0000
BKK_F51026	01 Jul 24	Y = 1.072x - 2.4854	1.0000
BKK_F51027	01 Jul 24	Y = 1.0154x - 4.4788	0.9999
BKK_F51028	01 Jul 24	Y = 1.0009x - 3.7755	1.0000
BKK_F51029	01 Jul 24	Y = 1.1118x - 4.4431	0.9995
BKK_F51030	01 Jul 24	Y = 1.0159x - 6.395	1.0000
BKK_F51031	01 Jul 24	Y = 0.9973x - 5.3371	0.9999
BKK_F51038	02 Jul 24	Y = 0.9992x + 9.6833	0.9992
BKK_F51040	01 Jul 24	Y = 1.0034x - 2.5343	1.0000
BKK_F51041	02 Jul 24	Y = 1.0511x + 1.1272	0.9996
BKK_F51042	02 Jul 24	Y = 1.0016x + 10.387	0.9995
BKK_F51043	01 Jul 24	Y = 0.9965x + 9.3743	1.0000
BKK_F51044	02 Jul 24	Y = 1.1237x - 0.4231	0.9981
BKK_F51200	01 Jul 24	Y = 1.0337x - 0.1016	0.9994
BKK_F51201	01 Jul 24	Y = 0.9871x + 5.0931	0.9996
BKK_F51202	01 Jul 24	Y = 0.7978x + 3.0130	0.9994
Phk_F50207	02 Jul 24	Y = 1.0722x + 3.4365	0.9998
Phk_F50208	02 Jul 24	Y = 1.0524x + 1.04	1.0000
Phk_F50209	02 Jul 24	Y = 0.999x + 12.73	1.0000
RYO_F50197	01 Jul 24	Y = 1.0045x + 10.291	1.0000
RYO_F50198	01 Jul 24	Y = 1.0055x + 1.8663	1.0000
RYO_F50199	02 Jul 24	Y = 1.0029x + 3.2361	0.9990



ROTA METER CALIBRATION RESULT JULY 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
RYG_F50054	02 Jul 24	Y = 1.0421x + 1.4935	1.0000
RYG_F50055	02 Jul 24	Y = 0.975x + 15.2	0.9994
RYG_F50056	01 Jul 24	Y = 1.0042x + 7.1067	0.9999
RYG_F50057	02 Jul 24	Y = 1.0337x + 1.8918	0.9998
RYG_F50058	02 Jul 24	Y = 0.9921x + 10.67	0.9996
RYG_F50059	01 Jul 24	Y = 1.0022x + 8.4152	1.0000
SGK_F50135	02 Jul 24	Y = 1.0159x + 3.6833	0.9999
SGK_F50136	02 Jul 24	Y = 1.0217x + 1.63	1.0000
SGK_F50138	02 Jul 24	Y = 1.055x + 4.5833	0.9999
SGK_F50139	02 Jul 24	Y = 1.0154x + 3.74	0.9998
SGK_F50140	02 Jul 24	Y = 1.0008x + 13.353	1.0000
SGK_F50141	02 Jul 24	Y = 1.1185x + 1.4867	0.9998
SGK_F50142	02 Jul 24	Y = 1.0211x + 1.39	1.0000
SGK_F50143	02 Jul 24	Y = 1.0045x + 5.6981	1.0000

Review By: Mr. Wichan Choonharat
Mr. Wichan Choonharat
Enviro Field Services Manager

Approved By: Mr. Sarayuth Jittrantorn
Mr. Sarayuth Jittrantorn
Assistant General Manager



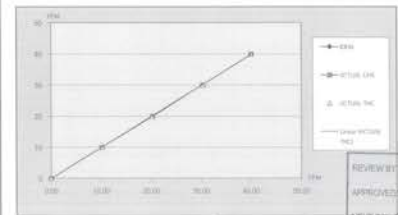
TEST REPORT

RYG_EN0038

CUSTOMER NAME	ALS Laboratory Group (Thailand) Co., Ltd. บริษัท ออล สเปเชียลties จำกัด (มหาชน) (วิสาหกิจ)
FORNMENT NAME	THC Analyzer
MANUFACTURER	HC8000
MODEL	8000-375
SERIAL NO.	U13037148
STANDARD GAS CONCENTRATION (PPM) (CH4)	100.1 PPM
CYLINDER NO.	CC79373
CYLINDER PRESSURE (psi)	1,600 PSI
CERTIFIED DATE	12/05/2020
CERTIFIED BY	AFGAS
EXPIRED DATE	12/05/2028

TEST RESULTS

POINT NO.	TEST RESULTS					
	IDEAL	ACTUAL CH4	ERROR CH4	ACTUAL THC	ERROR THC	REMARKS
1	10.01	10.01	0.00	10.01	0.00	-
2	10.01	10.15	0.15	10.15	0.14	2.13
3	20.00	20.30	0.30	20.10	0.10	0.50
4	30.00	30.29	0.29	30.33	0.33	1.10
5	40.00	40.01	0.00	40.00	0.00	0.00
AVERAGE (%)			0.99			0.93



Calibrated By: WNS
Checked By: Phu
Reviewed By: Phu
Approved By: Phu
Next Cal Date: 25/01/2025

For original certificate, please contact the company. For more information, please contact the company. For more information, please contact the company.

ALS Laboratory Group (Thailand) Co., Ltd.
CHECK LIST
CUSTOMER NAME : ALS Laboratory Group (Thailand) Co., Ltd.
EQUIPMENT NAME : THC Analyzer
MANUFACTURER : ICHIBI MODEL : APN-370 SERIAL NO. : 01020118
TEST VALUES
NO. THC Analyzer (APN-370) UNIT BEFORE AFTER
1 Signal (CH1) mV 35.60 35.80
2 Signal (THC) mV 35.80 35.20
3 Detector Temp. °C, Standard Value : Ambient Temp.(25±1)°C 40.00 40.00
4 Detector Pressure kPa, Standard Value : Ambient/1013.00-1015.00kPa 68.50 68.50
5 Ambient kPa current atmospheric pressure 100.50 100.50
6 Purifier °C, Standard Value : 300 °C to 430 °C 420.00 420.00
7 kPa, Normal value : 8 kPa to 25 kPa 8.00 8.00
8 MWEC °C, Standard Value : 220 °C to 240 °C 240.00 240.00
9 DC 24 V V, Standard Value : 24 V ± 0.5 V 24.00 24.00
10 DC 5 V V, Standard Value : 5 V ± 0.5 V 5.00 5.00
11 Flow Rate (Optional) L/min, Normal value : 0.9 L/min x 0.3 L/min - -
12 Over Flow (Optional) L/min, Standard value : 0.3 L/min or More - -
13 CH Sampling Reading PPM 270 270
14 THC Sampling Reading PPM 8.24 8.24
15 CH Sampling Reading PPM 2.18 2.18
16 Zero Gas CH20C PPM 9.13/0.14 9.13/0.14
17 Span Gas PPM 56.19/54.43 48.00/40.00
18 Gas ID - - 20 PPM 20 PPM
Remarks : Referencing EX-0107-06, Ambient HC Monitor APN-370 (Operation Manual Page 68)
Remarks : (Ambient temperature : 25 °C to 30 °C)
Calibrated By : J NAC 25/2/22
Checked By : J NAC 25/2/22
Signature of Mr. Jirawat Sakorn
Signature of Mr. Sarayuth Jitranont

ALS MULTIPOINT CALIBRATION REPORT
Calibration Date : 2-Jul-24
Manufacturer : Teledyne API
Serial No. : 2188
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_F50252
Model : 700
Cylinder No. : GN027222
Certified By : Airgas Inc.
Expired Date : 9-Feb-30
CALIBRATION RESULTS
Point 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 0.10
1 100.00 98.70 -1.30 -1.30 101.00 1.00 1.00
2 200.00 198.00 -2.00 -1.00 201.30 1.30 0.65
3 300.00 298.50 -1.50 -0.50 302.30 2.30 0.77
4 400.00 398.20 -1.80 -0.45 398.60 -1.40 -0.35
AVERAGE (%) -0.63 0.43
Graph showing Actual NOx vs Ideal NOx with a linear trendline.

ALS MULTIPOINT CALIBRATION REPORT
Calibration Date : 2-Jul-24
Manufacturer : HORIBA
Serial No. : SEEAW53E
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 : RYG_F50261
Model : 700
Cylinder No. : GN027222
Certified By : Airgas Inc.
Expired Date : 9-Feb-30
CALIBRATION RESULTS
Point 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 0.10
1 100.00 98.70 -1.30 -1.30 100.20 0.20 0.20
2 200.00 197.70 -2.30 -1.15 201.20 1.20 0.60
3 300.00 298.10 -1.90 -0.63 302.00 2.00 0.67
4 400.00 398.50 -1.50 -0.38 401.40 1.40 0.35
AVERAGE (%) -0.67 0.38
Graph showing Actual NOx vs Ideal NOx with a linear trendline.

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Certificate of System Qualification
GC-QG + GCMS-QG
System ID: RYG_KN0136
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 616/10, Moo 5, Tambol Mai Nam Khu, Phasi Charng, Rayong, 21140, Thailand
Date: January 5, 2024 10:53:24 AM
EQP Name: Agilent Recommended, Agilent Recommended
EQP Revision: GC.S2.54, GCMS.02.54
Overall Qualification Status: Pass
REVIEW BY: Chotichai
APPROVED BY: D. K.
NEXT CAL DATE: 01/01/2025
CDS Logon Verification - GC
Logon: chotichai.kurudat
Overall CDS Logon Verification - GC Test Status
Pass
System Inspection and Basic Safety and Operation
Name: 7890
Setpoint Status: Pass
Overall System Inspection and Basic Safety and Operation Test Status
Pass
Inlet Pressure Accuracy
Name: 7890
Front: SSL
Setpoint Status: Pass
Setpoint: 25.0 psi Actual: 25 psi
Inlet Pressure: 25.0 psi Accuracy: 0.0 psi Agilent Recommended: <= 1.2 psi
Date: January 5, 2024 10:53:24 AM
System ID: RYG_KN0136
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Overall Inlet Pressure Accuracy Test Status
Pass
GC Oven Temperature Accuracy
Name: 7890
Setpoint Status: Pass
Zone: Oven
Setpoint/Actual: 220.0 / 229 °C
Temperature: 220.0 229 °C
Accuracy: -1.0 °C
Agilent Recommended: >= -1.0 °C setpoint in K (-1.0 °C) <= 1.0 °C setpoint in K (1.0 °C)
Setpoint Status: Pass
Zone: Oven
Setpoint/Actual: 100.0 / 100.0 °C
Temperature: 100.0 100.0 °C
Accuracy: 0.0 °C
Agilent Recommended: >= -1.0 °C setpoint in K (-1.0 °C) <= 1.0 °C setpoint in K (1.0 °C)
Overall GC Oven Temperature Accuracy Test Status
Pass
GC Oven Temperature Stability
Name: 7890
Setpoint Status: Pass
Setpoint/Average: 100.0 / 100.8167 °C
Temperature: 100.0 100.8167 °C
Stability: 0.1 °C
Agilent Recommended: <= 0.5 °C
Overall GC Oven Temperature Stability Test Status
Pass
Date: January 5, 2024 10:53:24 AM
System ID: RYG_KN0136
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Log Amp
Tested Combination1: Front SSL / External SQ
Name: 58778
Setpoint Status: Pass
Overall Log Amp Test Status
Pass
RPPA
Tested Combination1: Front SSL / External SQ
Name: 58778
Setpoint Status: Pass
Amps: 1050 mV Drift After Five Minutes: 8 mV RPPA Voltage: 509 mV
Agilent Recommended: >= -100 and <= 100 <= 1100 mV
Overall RPPA Test Status
Pass
Tune E1
Tested Combination1: Front SSL / External SQ
Name: 58778
Setpoint Status: Pass
Flameout: 1
Setpoint Status: Pass
Flameout: 2
Overall Tune E1 Test Status
Pass
Scouting Run
Date: January 5, 2024 10:53:24 AM
System ID: RYG_KN0136
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User Name: admin@postgresql System ID: 8105_540138
 Report Generated by Postman: 43813016129 Print Date: January 1, 2024 10:03:05 AM

[illegible]

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Date: January 8, 2024 10:53:24 AM
System ID: RYG_E140136

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User Name: jafar@jafar.com System ID: RYD_00013
 Report Generated by: jafar@jafar.com File Date: January 5, 2024 10:52:25 AM

Time	Transaction Type	Activity Performed	Type of Transaction	Optional Information
January 5, 2020 14:50:30 PM	End	Executed	Time ID: 00789 B2 - Source: - Run Count: 1 - Estimated Process 1 (Estimated file savings)	
January 5, 2020 14:50:52 PM	Start	Executed	Streaming Run - Manual Execution: From ESB, SD - Source: - E - Estimated Process of GCMS System Preparation	None
January 5, 2020 2:22:35 PM	Auto PM	Not Occurred	Session	
January 5, 2020 2:28:16 PM	Auto PM	Auto PM Failed	Session	
January 5, 2020 2:28:16 PM	Auto PM	Session Rescheduled	Session	None
January 5, 2020 2:28:29 PM	Start	Qualification	Session	CO
January 5, 2020 2:28:29 PM	Start	Execution	Streaming Run - Manual Execution: From ESB, SD - Source: - E - Estimated Process of GCMS System Preparation	None
January 5, 2020 5:21:29 PM	Auto PM	Data	Streaming Run - Manual Execution: From ESB, SD - Source: - E - Estimated Process of GCMS System Preparation	File Size: 10 - OGG/Segment 2
January 5, 2020 8:21:52 PM	End	Executed	Streaming Run - Manual Execution: From ESB, SD - Source: - E - Estimated Process of GCMS System Preparation	Run Count: 1
January 5, 2020 8:23:10 PM	Start	Executed	Signal to Source ID - Qualification Execution: From ESB, SD - Source: - E - Estimated Process of GCMS System Preparation	None

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Date: January 5, 2024 10:53:24 AM
System ID: RYC_EN0438

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User Name: adeline_juarez System ID: MYO_20
 Report Generated by Webstore: ASRT00000000 Print Date: January 5, 2024 10:52:21

[illegible]

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Date: January 5, 2025 10:53:24 AM
System ID: RYQ_EN0136

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User Name: sakshi_pawar
Report Generated By: Hesthane: A397-000074
System ID: KYC_ENG13
Print Date: January 3, 2024 10:32:25 AM

[illegible]

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Date: January 5, 2024 10:53:34 AM
System ID: RYG_EN0136

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User Name: sakshi_purojeja System ID: 819, 88013
Report Generated By Webuser: ASHTL00014 Print Date: January 8, 2024 10:02:25 AM

[illegible]

Figure 9.2

Date: January 9, 2024 10:53:24 AM
System ID: RYG_EN0138

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ROTA METER CALIBRATION RESULT APRIL 2024

Rotameter ID	Calibration Date	Regression Result	Coefficient (K)
BKQ_F05085	23 Apr 24	$Y = 1.0322x + 2.25$	0.9997
BKQ_F05087	23 Apr 24	$Y = 1.0111x + 16.367$	0.9994
BKQ_F05092	23 Apr 24	$Y = 1.001x + 14.551$	1.0000
BKQ_F05094	23 Apr 24	$Y = 1.044x + 4.9762$	1.0000
BKQ_F01004	01 Apr 24	$Y = 0.9820x + 12.32$	0.9999
BKQ_F01005	01 Apr 24	$Y = 1.0183x + 0.0533$	0.9999
BKQ_F01006	01 Apr 24	$Y = 1.1534x - 3.3241$	0.9989
BKQ_F01007	23 Apr 24	$Y = 1.038x + 2.0017$	0.9994
BKQ_F01026	06 May 24	$Y = 1.147x + 2.1915$	0.9995
BKQ_F01011	07 May 24	$Y = 1.3695x - 7.1671$	0.9994
BKQ_F01012	07 May 24	$Y = 1.0483x - 26.533$	0.9994
BKQ_F01013	07 May 24	$Y = 1.0255x - 7.41$	1.0003
BKQ_F01017	04 Apr 24	$Y = 0.7213x + 0.1156$	1.0000
BKQ_F01018	04 Apr 24	$Y = 1.0037x + 1.3933$	0.9999
BKQ_F01019	04 Apr 24	$Y = 1.0038x - 1.3381$	1.0000
BKQ_F01020	04 Apr 24	$Y = 1.003x + 5.7656$	1.0000
BKQ_F01021	04 Apr 24	$Y = 1.0066x - 25.808$	0.9976
BKQ_F01022	04 Apr 24	$Y = 1.0037x - 103.66$	0.9980
BKQ_F01023	07 May 24	$Y = 1.1613x - 2.675$	1.0000
BKQ_F01024	07 May 24	$Y = 1.0157x + 4.2362$	1.0000
BKQ_F01025	07 May 24	$Y = 1.0018x - 4.6236$	0.9999
BKQ_F01029	01 Apr 24	$Y = 0.9950x + 11.37$	0.9991
BKQ_F01040	01 Apr 24	$Y = 1.0011x - 19.203$	0.9996
BKQ_F01041	01 Apr 24	$Y = 1.0176x + 1.4813$	0.9996
BKQ_F01042	01 Apr 24	$Y = 0.9627x + 10.76$	0.9995
BKQ_F01043	01 Apr 24	$Y = 0.9995x + 13.696$	1.0000
BKQ_F01044	01 Apr 24	$Y = 1.1159x - 0.9354$	0.9978
PHK_F02027	06 May 24	$Y = 1.1281x + 0.4940$	0.9997
PHK_F02028	06 May 24	$Y = 0.9332x - 1.5233$	0.9999
PHK_F02020	06 May 24	$Y = 1.001x + 10.848$	1.0000
RYG_F050197	01 Apr 24	$Y = 1.0046x + 0.275$	1.0000
RYG_F050198	01 Apr 24	$Y = 1.0001x + 0.715$	0.9999
RYG_F050199	01 Apr 24	$Y = 0.876x + 3.1407$	0.9998
RYG_F050654	01 Apr 24	$Y = 1.0554x + 0.3361$	0.9996
RYG_F050655	01 Apr 24	$Y = 0.876x + 13.003$	0.9991
RYG_F05066	01 Apr 24	$Y = 1.0035x + 6.879$	0.9999
RYG_F050657	01 Apr 24	$Y = 1.0233x + 0.8608$	0.9982
RYG_F050658	01 Apr 24	$Y = 0.9905x + 9.6867$	0.9995
RYG_F050659	01 Apr 24	$Y = 0.9994x + 13.924$	1.0000

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ALS Laboratory Group



ROTA METER CALIBRATION RESULT APRIL 2024

Rotameter ID	Calibration Date	Regression Result	Coefficient (R ²)
SGK_FS0135	23 Apr 24	$Y = 1.0117x + 4.8833$	1.0000
SGK_FS0136	23 Apr 24	$Y = 1.0134x + 3.6467$	1.0000
SGK_FS0138	04 Apr 24	$Y = 1.0440x - 0.3684$	0.9985
SGK_FS0139	04 Apr 24	$Y = 1.0009x + 3.1207$	0.9985
SGK_FS0140	04 Apr 24	$Y = 1.0020x + 7.5181$	1.0000
SGK_FS0141	23 Apr 24	$Y = 1.1120x - 0.0519$	0.9997
SGK_FS0142	23 Apr 24	$Y = 1.0136x + 2.4207$	0.9999
SGK_FS0143	23 Apr 24	$Y = 1.0036x + 8.3162$	1.0000

Review By: Wichan Choonharat
(Mr. Wichan Choonharat)
Enviro Field Services Manager

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

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Certificate of System Qualification
GC-O2

System ID: CN11481068
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250

Date: April 21, 2023 3:26:38 PM
EOP Name: AgilentRecommended
EOP Revision: GC-02.02
Overall Qualification Status: Pass

CDS Leagen Verification - GC

Leagen: Sawaguchi Tank

Overall CDS Leagen Verification - GC Test Status
Pass

System Inspection and Basic Safety and Operation

Name: 7890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status
Pass

Inlet Pressure Decay

Name: 7890
Front SSL
Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: -0.1 psi / 5 minutes
Agilent Recommended: ± 2.0 and ± 0.5

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL
Setpoint Status: Pass
Inlet Pressure: 25.0 psi
Accuracy: 0.2 psi
Agilent Recommended: ± 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL
Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.0 psi / 5 minutes
Agilent Recommended: ± 2.0 and ± 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Setpoint Status: Pass
Inlet Pressure: 25.0 psi
Accuracy: 0.2 psi
Agilent Recommended: ± 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID
Setpoint Status: Pass
Flow Type: Fuel
Setpoint: 30.0 mL/min
Measured Flow: 28.9 mL/min
Accuracy: 1.1 mL/min
Agilent Recommended: ± 10.0 % setpoint (2.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass
Flow Type: Oxidizer
Setpoint: 400.0 mL/min
Measured Flow: 400 mL/min
Accuracy: 0.0 mL/min
Agilent Recommended: ± 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass
Flow Type: Makeup
Setpoint: 25.0 mL/min
Measured Flow: 24.9 mL/min
Accuracy: 0.1 mL/min
Agilent Recommended: ± 10.0 % setpoint (2.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Agilent CrossLab Compliance Services

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back FID
Setpoint Status: Pass
Flow Type: Fuel
Setpoint: 30.0 mL/min
Measured Flow: 30.7 mL/min
Accuracy: 0.7 mL/min
Agilent Recommended: ± 10.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass
Flow Type: Oxidizer
Setpoint: 400.0 mL/min
Measured Flow: 399 mL/min
Accuracy: 1.0 mL/min
Agilent Recommended: ± 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass
Flow Type: Makeup
Setpoint: 25.0 mL/min
Measured Flow: 24.8 mL/min
Accuracy: 0.4 mL/min
Agilent Recommended: ± 10.0 % setpoint (2.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Agilent CrossLab Compliance Services

Setpoint Status: Pass
Zone: Oven
Temperature: 230.0
Setpoint/Average: 230.8 °C
Accuracy: 0.8 °C
Agilent Recommended: ± 1.0 % setpoint in K (5.0 °C)
 ± 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass
Zone: Oven
Temperature: 100.0
Setpoint/Average: 100.9 °C
Accuracy: 0.9 °C
Agilent Recommended: ± 1.0 % setpoint in K (3.7 °C)
 ± 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890
Setpoint Status: Pass
Temperature: 100.0
Setpoint/Average: 100.8833 °C
Stability: 0.1 °C
Agilent Recommended: ± 0.5 °C

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination: Front SSL / Front FID
Name: 7890A

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status: Completed

Noise and Drift

Tested Combination1	Front	SSL	/ Front	FID
Name:	7890			
Setpoint Status:	Pass			
Base Signal:	22.7 pA			
ASTM Noise		Drift		
pA	0.06	pAHz	0.05	
Agilent Recommended:	<= 0.10	Agilent Recommended:	<= 2.50	
Status:	Pass	Status:	Pass	

Overall Noise and Drift Test Status: Pass

Injection Precision

Tested Combination1	Front	SSL	/ Front	FID	
Name:	7890A				
Setpoint Status:	Pass				
Injection Volume on Column:	1.0 µL	Area RSD:	0.32 %	Retention Time RSD:	0.87 %
Agilent Recommended:	<= 3.00	Agilent Recommended:	<= 1.00		

Overall Injection Precision Test Status: Pass

Signal to Noise

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Tested Combination1: Front SSL / Front FID

Injection Tower: 7890

Name: 7890

Setpoint Status: Pass

Signal to Noise: 721750

Agilent Recommended: <= 300000

Overall Signal to Noise Test Status: Pass

Scouting Run

Tested Combination2: Back SSL / Back FID

Injection Tower: 7890A

Name: 7890A

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status: Completed

Noise and Drift

Tested Combination2	Back	SSL	/ Back	FID
Name:	7890A			
Setpoint Status:	Completed			
Base Signal:	22.8 pA			
ASTM Noise		Drift		
pA	0.07	pAHz	0.09	
Agilent Recommended:	<= 0.10	Agilent Recommended:	<= 2.50	
Status:	Pass	Status:	Pass	

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Overall Noise and Drift Test Status: Pass

Injection Precision

Tested Combination2	Back	SSL	/ Back	FID	
Name:	7890A				
Setpoint Status:	Pass				
Injection Volume on Column:	1.0 µL	Area RSD:	1.28 %	Retention Time RSD:	0.83 %
Agilent Recommended:	<= 3.00	Agilent Recommended:	<= 1.00		

Overall Injection Precision Test Status: Pass

Signal to Noise

Tested Combination2	Back	SSL	/ Back	FID
Name:	7890			
Setpoint Status:	Pass			
Signal to Noise:	2454398			
Agilent Recommended:	<= 300000			

Overall Signal to Noise Test Status: Pass

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Instrument Details

Purpose: This section describes the as found system configuration.

Details

System

System ID:	CN11481068
Manufacturer:	Agilent Technologies
Name:	7890
Flow Data Input:	Manual Data
Temperature Data Input:	Manual Data or Other Data Logging

Tested Combination1

Injection Technique:	Injection Tower
Sampler Identifier:	Sampler 2
Intei:	Front
Detector:	Front
LTM Included?	No

Tested Combination2

Injection Technique:	Injection Tower
Sampler Identifier:	Sampler 3
Intei:	Back
Detector:	Back
LTM Included?	No

Sampler 1

Manufacturer:	Agilent Technologies
Type:	Trey
Name:	7890A
Model Number:	G4514A
Serial Number:	CN15380930
Firmware Revision:	A.11.01
Vial Heater:	Not installed

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Sampler 2

Manufacturer:	Agilent Technologies
Type:	Injection Tower
Name:	7890A
Model Number:	G4513A
Serial Number:	CN16280128
Firmware Revision:	A.10.09
Usage:	Sample Injection
Location:	Front
Syringe Volume (µL):	10

Sampler 3

Manufacturer:	Agilent Technologies
Type:	Injection Tower
Name:	7890A
Model Number:	G4513A
Serial Number:	CN10340103
Firmware Revision:	A.10.09
Usage:	Sample Injection
Location:	Back
Syringe Volume (µL):	10

Mainframe 1

Manufacturer:	Agilent Technologies
Name:	7890
Model Number:	G3440A
Serial Number:	CN11481068
Firmware Revision:	Version 4.27
Oven Type:	Standard

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Inlet 1

Manufacturer:	Agilent Technologies
Name:	7890
Type:	SSL
Location:	Front
Carrier Gas:	Helium
Control Type:	Electronic Pressure Control (EPC)
Purged Inlet:	Yes

Inlet 2

Manufacturer:	Agilent Technologies
Name:	7890
Type:	SSL
Location:	Back
Carrier Gas:	Helium
Control Type:	Electronic Pressure Control (EPC)
Purged Inlet:	Yes

Detector 1

Manufacturer:	Agilent Technologies
Name:	7890
Type:	FID
Adapter:	Capillary
Control Type:	Electronic Pressure Control (EPC)
Location:	Front
Makeup Gas:	Nitrogen

Detector 2

Manufacturer:	Agilent Technologies
Name:	7890
Type:	FID
Adapter:	Capillary
Control Type:	Electronic Pressure Control (EPC)
Location:	Back
Makeup Gas:	Nitrogen

Date: April 21, 2023 3:26:38 PM
System ID: CN11481068

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Resumen: LAFTOP-CO3380NW

GC-4_SPK_ENHDET_ALB Transaction log

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Agilent CrestLab Compliance Services

ISSN: 1471-0749

UC-6, 800, 80022, ALS Downloaded by

[illegible]

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Reference: LAP 12P-0239X039

GC-4_DPK_EN0127_ALE Transaction log:

Date	Transaction Date	Activity Performed	Type of Transaction	Optional Information
April 21, 2013	11/26/2014	Start	Debit/ Pay Accounts Payable - None P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	Auto	Debit/ Pay Accounts Payable - Manual Data Entry P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	End	Debit/ Pay Accounts Payable - Run Count: 1 P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	Start	Debit/ Pay Accounts Payable - None P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	Auto	Debit/ Pay Accounts Payable - Manual Data Entry P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	End	Debit/ Pay Accounts Payable - Run Count: 1 P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	Start	Debit/ Pay Accounts Payable - None P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	Auto	Debit/ Pay Accounts Payable - Manual Data Entry P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	End	Debit/ Pay Accounts Payable - Run Count: 1 P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	Start	Debit/ Pay Accounts Payable - None P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	
April 21, 2013	11/26/2014	Auto	Debit/ Pay Accounts Payable - Manual Data Entry P/O: Type: Customer - # 6012 A/R Invoice: -1 => 10.00 unpaid	

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hostname: LAPTOP-2Q25K0WV

DC-6, 60K, 100127, A, 5 Transmitter Eng.

Date	Transcussion Date	Activity Performed	System/Process Activity	Optional Information
April 21, 2023 11:08:43 AM	End	Execution	Device Flow Activity: End FPC - Type: Outbound - 0.003 mSec mSec - min: 0.003 mSec	Run Count: 1
April 21, 2023 11:08:45 AM	Start	Execution	Device Flow Activity: Start FPC - Type: Inbound - 0.003 mSec mSec - min: 0.003 mSec	None
April 21, 2023 11:07:01 AM	Start	Idle	Device Flow Activity: Idle FPC - Type: Inbound - 0.003 mSec mSec - min: 0.003 mSec	Manual Data Entry
April 21, 2023 11:07:05 AM	End	Execution	Device Flow Activity: End FPC - Type: Outbound - 0.003 mSec mSec - min: 0.003 mSec	Run Count: 1
April 21, 2023 11:07:07 AM	Start	Execution	GC GC Temperature Activity: 1800C - Temperature mSec - min: 0.003 (PC) - min: 0.0 mSec - min: 0.0 mSec	None
April 21, 2023 11:07:08 AM	Start	Idle	GC GC Temperature Activity: 1800C - Temperature mSec - min: 0.003 (PC) - min: 0.0 mSec - min: 0.0 mSec	Manual Data Entry
April 21, 2023 11:07:09 AM	End	Execution	GC GC Temperature Activity: 1800C - Temperature mSec - min: 0.003 (PC) - min: 0.0 mSec - min: 0.0 mSec	Run Count: 1
April 21, 2023 11:07:09 AM	Start	Execution	GC GC Temperature Activity: 1800C - Temperature mSec - min: 0.003 (PC) - min: 0.0 mSec - min: 0.0 mSec	None
April 21, 2023 11:07:09 AM	Start	Idle	GC GC Temperature Activity: 1800C - Temperature mSec - min: 0.003 (PC) - min: 0.0 mSec - min: 0.0 mSec	Manual Data Entry

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Keywords: Laptops, children, school, technology, digital divide

DC-6, BKX, D98127, ALS Transaction by

[illegible]

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QC4_BOK_030127_0LS Transaction log

[illegible]

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Date: April 21, 2023 3:26:39 PM
System ID: CN11431068

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Order Number: 200004012005
 Hostname: LAPTOP-CQ558QWY
 System ID: CN1487
 Print Date: April 25, 2013 3:28:45
 GC-6_BKK_CN0127_ALS Transaction log:

[illegible]

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Date: April 21, 2023 2:26:58 PM
System ID: CN15481008

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User Name: saurajkulkarni
 Hostname: JAPTOP-603380NV
 System ID: CH114R10
 Print Date: April 21, 2023 5:28:46 PM
 GC4_BKK_030127_ALS transaction log |

[illegible]

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Date: April 21, 2023 3:28:38 PM
System ID: CN11481908

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Host Name: xwmg01fal.hack
MacAddress: LAPTOP-CQ32K4QWV
Print Date: April 25, 2022 2:28:40
BC-4_WX_SW422_ALS Transcription log:

Time	Transmission Date	Activity Performed	Type of Transmission	Additional Information
April 25, 2022 11:30:29 AM	April	Date	Signal Name - <i>Injection</i> Trans - <i>Fast BS1</i> , <i>Fast FID</i> Sensor - <i>FID 1</i> , <i>++ 300000</i>	Date Data Path - <i>C:\ProgramData\msdchem\msdchem\fastbs1\fastbs1_data\2022-04-25_113029-04-29_300000-04-29</i> <i>14-04-2022_FastBS1_FID1</i> <i>all</i>
April 25, 2022 11:30:50 AM	April	Execution	Signal to Name - <i>Injection</i> Trans - <i>Fast BS1</i> , <i>Fast FID</i> Sensor - <i>FID 1</i> , <i>++ 300000</i>	Run Count: 1
April 25, 2022 11:30:50 AM	April	Execution	GC Baking Run - <i>Injection</i> Trans - <i>Fast BS1</i> , <i>Fast FID</i> Part of System Preparation - <i>Injection</i> <i>Injection</i> associated	None
April 25, 2022 11:30:50 AM	April	Date	Date Data Path - <i>C:\ProgramData\msdchem\msdchem\fastbs1\fastbs1_data\2022-04-25_113050-04-29_300000-04-29</i> <i>14-04-2022_FastBS1_FID1</i> <i>all</i>	Date Data Path - <i>C:\ProgramData\msdchem\msdchem\fastbs1\fastbs1_data\2022-04-25_113050-04-29_300000-04-29</i> <i>14-04-2022_FastBS1_FID1</i> <i>all</i>
April 25, 2022 11:31:00 AM	April	Execution	GC Baking Run - <i>Injection</i> Trans - <i>Fast BS1</i> , <i>Fast FID</i> Part of System Preparation - <i>Injection</i> <i>Injection</i> associated	Run Count: 1
April 25, 2022 11:31:02 AM	April	Execution	Notes and Data - <i>Injection</i> FID - <i>L 3000</i> <i>1.0 µL x 1.0000 x 1.0000</i> <i>Injection</i>	

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Date: April 21, 2023 3:28:38 PM
System ID: CN11481006

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User Name: saungu@at.bwh
 Username: LAFT0P-C03R0WV
 System ID: CN7548100
 Print Date: April 21, 2022 3:28:40 PM
 GC-4_SIX_EW012F_ALS Transaction log:

Type	Timestamp	Activity	Type of Transaction	Optional Information
April 21, 2023 11:40:57 AM	Audit	Data	Hydrex Precision - Injection Test: Basd, Bsd, Bsq, FQ Q1 - 1 (Pres) = 3.0% - 1, (Pst Time) = 1.0%	Data Box Path: C:\sw\Path\Bsd\Bsq\FQ\Q1 _A3_2023-04-20-09_Q1 _A3_2023-04-20-09_Q1 10-37-2017-0886-D2P 36.0
April 21, 2023 11:40:57 AM	Data	Injection Test: Basd, Bsd, Bsq, FQ Q1 - 1 (Pres) = 3.0% - 1, (Pst Time) = 1.0%	Doc Path: C:\sw\Path\Bsd\Bsq\FQ\Q1 _A3_2023-04-20-09_Q1 _A3_2023-04-20-09_Q1 10-37-2017-0886-D2P 36.0	
April 21, 2023 11:40:57 AM	Audit	Data	Hydrex Precision - Injection Test: Basd, Bsd, Bsq, FQ Q1 - 1 (Pres) = 3.0% - 1, (Pst Time) = 1.0%	Data Box Path: C:\sw\Path\Bsd\Bsq\FQ\Q1 _A3_2023-04-20-09_Q1 _A3_2023-04-20-09_Q1 10-37-2017-0886-D2P 36.0
April 21, 2023 11:40:57 AM	Data	Injection Test: Basd, Bsd, Bsq, FQ Q1 - 1 (Pres) = 3.0% - 1, (Pst Time) = 1.0%	Doc Path: C:\sw\Path\Bsd\Bsq\FQ\Q1 _A3_2023-04-20-09_Q1 _A3_2023-04-20-09_Q1 10-37-2017-0886-D2P 36.0	
April 21, 2023 11:41:00 AM	Endnote	Hydrex Precision - Injection Test: Basd, Bsd, Bsq, FQ Q1 - 1 (Pres) = 3.0% - 1, (Pst Time) = 1.0%	Doc Path: C:\sw\Path\Bsd\Bsq\FQ\Q1 _A3_2023-04-20-09_Q1 _A3_2023-04-20-09_Q1 10-37-2017-0886-D2P 36.0	Proc Count: 1
April 21, 2023 11:41:00 AM	Evaluation	Signal to Noise - Injection Test: Basd, Bsd, Bsq, FQ	Doc Path: C:\sw\Path\Bsd\Bsq\FQ\Q1 _A3_2023-04-20-09_Q1 _A3_2023-04-20-09_Q1 10-37-2017-0886-D2P 36.0	Note

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Date: April 21, 2023 3:29:38 PM
System ID: CN11481008

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User Name: vcomp@redhat.com System ID: CN1146
Username: LAPTOP-G008R026V Print Date: April 21, 2012 2:20:41
GC 4, 50K, 590127, ALS Transceiver log:

[illegible]

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Date: April 21, 2023 2:28:38 PM
System ID: CH11461066

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Certificate of System Qualification
GC-QQ

System ID: GC-4_CN11461066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanaburi Rd Khwaeng Suan Luang, Khut Suan Luang, Bangkok 10250

Date: October 22, 2024 9:27:05 AM
EQP Name: Agilent Recommended
EQP Revision: GC.03.53
Overall Qualification Status: Pass

REVIEW BY: *[Signature]*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 02 Apr 2026

CD5 Leaky Verification - GC

Leaky: Saengulha Tanak

Overall CD5 Leaky Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890
Setup Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890
Front SSL

Setup Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.0 psi / 5 minutes
Agilent Recommended: ± 0.2 and ± 0.5

Date: October 22, 2024 9:27:05 AM
System ID: GC-4_CN11461066

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Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setup Status: Pass
Inlet Pressure: 25.0 psi Actual: 25.07 psi
Accuracy: 0.1 psi
Agilent Recommended: ± 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL

Setup Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.0 psi / 5 minutes
Agilent Recommended: ± 0.2 and ± 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Date: October 22, 2024 9:27:05 AM
System ID: GC-4_CN11461066

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Setup Status: Pass

Inlet Pressure: 25.0 psi Actual: 25.08 psi
Accuracy: 0.1 psi
Agilent Recommended: ± 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID

Setup Status: Pass
Flow Type: Flat
Setup: 30.0 mL/min Measured Flow: 28.8 mL/min
Accuracy: 1.2 mL/min
Agilent Recommended: ± 10.0 % setup (3.0 min)
Limit is percentage of setup or 0.5 mL/min, whichever is largest.

Setup Status: Pass
Flow Type: Outdoor
Setup: 400.0 mL/min Measured Flow: 392 mL/min
Accuracy: 8.0 mL/min
Agilent Recommended: ± 10.0 % setup (40.0 min)
Limit is percentage of setup or 0.5 mL/min, whichever is largest.

Setup Status: Pass
Flow Type: Makeup
Setup: 25.0 mL/min Measured Flow: 25.4 mL/min
Accuracy: 0.4 mL/min
Agilent Recommended: ± 10.0 % setup (2.5 min)
Limit is percentage of setup or 0.5 mL/min, whichever is largest.

Date: October 22, 2024 9:27:05 AM
System ID: GC-4_CN11461066

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Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back FID

Setup Status: Pass
Flow Type: Fuel
Setup: 30.0 mL/min Measured Flow: 30.8 mL/min
Accuracy: 0.8 mL/min
Agilent Recommended: ± 10.0 % setup (3.0 min)
Limit is percentage of setup or 0.5 mL/min, whichever is largest.

Setup Status: Pass
Flow Type: Outdoor
Setup: 400.0 mL/min Measured Flow: 393 mL/min
Accuracy: 7.0 mL/min
Agilent Recommended: ± 10.0 % setup (40.0 min)
Limit is percentage of setup or 0.5 mL/min, whichever is largest.

Setup Status: Pass
Flow Type: Makeup
Setup: 25.0 mL/min Measured Flow: 25.2 mL/min
Accuracy: 0.2 mL/min
Agilent Recommended: ± 10.0 % setup (2.5 min)
Limit is percentage of setup or 0.5 mL/min, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: October 22, 2024 9:27:05 AM
System ID: GC-4_CN11461066

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Setup Status: Pass
Zone: Oven

Temperature: 230.0 230.3 °C
Accuracy: 0.3 °C
Agilent Recommended: ± 1.0 % setup in K (6.0 °C)
 ± 1.0 % setup in K (6.0 °C)

Setup Status: Pass
Zone: Oven

Temperature: 100.0 100.0 °C
Accuracy: 0.0 °C
Agilent Recommended: ± 1.0 % setup in K (3.7 °C)
 ± 1.0 % setup in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890
Setup Status: Pass

Setup/Average
Temperature: 100.0 100.0187 °C
Stability: 0.1 °C
Agilent Recommended: ± 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination: Front SSL / Front FID
Injection Tower
Name: 7893A

Date: October 22, 2024 9:27:05 AM
System ID: GC-4_CN11461066

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Setup Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination: Front SSL / Front FID
Name: 7890

Setup Status: Pass
Base Signal: 14.08 µA

ASTM Noise: 0.05 pA
Drift: 0.03 pA/Hr
Agilent Recommended: ± 10.0 %
Status: Pass

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination: Front SSL / Front FID
Name: 7893A

Setup Status: Pass
Injection Volume on Column: 1.0 µL

Area RSD: 0.30 %
Agilent Recommended: ± 3.00 %
Retention Time RSD: 0.03 %
 ± 1.00 %

Overall Injection Precision Test Status

Pass

Signal to Noise

Date: October 22, 2024 9:27:05 AM
System ID: GC-4_CN11461066

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Tested Combination1

FrontSSL / FrontFID

Name:7890Injection Tower

Setup Status:Pass

Signal to Noise:11076208

Agilent Recommended:300000

Overall Signal to Noise Test Status:Pass

Scouting Run

Tested Combination2

BackSSL / BackFID

Name:7893AInjection Tower

Setup Status:Completed

Injection Volume on Column:1.0µL

Overall Scouting Run Status:Completed

Noise and Drift

Tested Combination2

BackSSL / BackFID

Name:7890Injection Tower

Setup Status:Pass

Base Signal:13.79pA

ASTM Noise

pA0.05

Agilent Recommended:0.10

Status:Pass

Drift

pA3h2.80

Agilent Recommended:2.80

Status:Pass

Date:October 22, 2024 9:27:05 AM

System ID:GC-E_CN11481086

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Agilent CrossLab Compliance Services

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2

BackSSL / BackFID

Name:7893AInjection Tower

Setup Status:Pass

Injection Volume on Column:1.0µL

Area RSD:1.00%

Agilent Recommended:3.00

Retention Time RSD:0.83%

Agilent Recommended:1.00

Overall Injection Precision Test Status:Pass

Signal to Noise

Tested Combination2

BackSSL / BackFID

Name:7890Injection Tower

Setup Status:Pass

Signal to Noise:1771221

Agilent Recommended:300000

Overall Signal to Noise Test Status:Pass

Date:October 22, 2024 9:27:05 AM

System ID:GC-E_CN11481086

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Agilent CrossLab Compliance Services

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System IDGC-E_CN11481086

ManufacturerAgilent Technologies

Name7890

Flow Data InputManual Data

Temperature Data InputManual Data or Other Data Logging

Tested Combination1

Injection TechniqueInjection Tower

Sampler IdentifierSampler 1

InletFront

DetectorFront

LTM Included?No

Tested Combination2

Injection TechniqueInjection Tower

Sampler IdentifierSampler 2

InletBack

DetectorBack

LTM Included?No

Sampler 1

ManufacturerAgilent Technologies

TypeInjection Tower

Name7893A

Model NumberG4513A

Serial NumberCHN10340103

Firmware RevisionA.11.06

UsageSample Injection

LocationFront

Syringe Volume (µL)10

Date:October 22, 2024 9:27:05 AM

System ID:GC-E_CN11481086

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Agilent CrossLab Compliance Services

Sampler 2

ManufacturerAgilent Technologies

TypeInjection Tower

Name7893A

Model NumberG4513A

Serial NumberCHN10340103

Firmware RevisionA.11.06

UsageSample Injection

LocationBack

Syringe Volume (µL)10

Sampler 3

ManufacturerAgilent Technologies

TypeTray

Name7893A

Model NumberG4514A

Serial NumberCN115380030

Firmware RevisionA.11.03

Vald HeaderNot installed

Maintenance 1

ManufacturerAgilent Technologies

Name7890

Model NumberG5445A

Serial NumberCN11481086

Firmware RevisionA.01.16

Oven TypeStandard

Date:October 22, 2024 9:27:05 AM

System ID:GC-E_CN11481086

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Agilent CrossLab Compliance Services

Inlet 1

ManufacturerAgilent Technologies

Name7890

TypeSSL

LocationFront

Carrier GasHelium

Control TypeElectronic Pressure Control (EPC)

Purged InletYes

Inlet 2

ManufacturerAgilent Technologies

Name7890

TypeSSL

LocationBack

Carrier GasHelium

Control TypeElectronic Pressure Control (EPC)

Purged InletYes

Detector 1

ManufacturerAgilent Technologies

Name7890

TypeFID

AdapterCapillary

Control TypeElectronic Pressure Control (EPC)

LocationFront

Makeup GasNitrogen

Detector 2

ManufacturerAgilent Technologies

Name7890

TypeFID

AdapterCapillary

Control TypeElectronic Pressure Control (EPC)

LocationBack

Makeup GasNitrogen

Date:October 22, 2024 9:27:05 AM

System ID:GC-E_CN11481086

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Details

Full Name of SignerSaengulhak Teraik

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Signature Creation Date:October 22, 2024

Reason for Signature:Excluded pretest and published this original version of document

Regulatory Disclaimer

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Date:October 22, 2024 9:27:05 AM

System ID:GC-E_CN11481086

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[illegible]

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN01481068

New Items Assigned from the Request Generated by Processors				System for Data Collection Feed Dates: 08-29-2016 07:06	
ALB_AIS_04-01M16MSL_D2WH Transaction Hierarchy					
Date	Transaction Date	Activity	Type of Transaction	Optional Information	
October 27, 2016 13:24:01	End	Execution	Instr Pressure Detail - Front SBL - Pressure Controlled time + 0.50 sec +/- + 0.2 sec and + 0.5 sec	None	
October 27, 2016 13:24:01	End	Execution	Instr Pressure Detail - Rear SBL - Pressure Controlled time + 0.50 sec +/- + 0.5 sec and + 0.5 sec	Run Count : 1	
October 27, 2016 13:24:01	Start	Execution	Instr Pressure Analysis - Front SBL - Pressure Controlled time + 0.50 sec +/- + 0.2 sec	None	
October 27, 2016 13:24:01	End	Execution	Instr Pressure Analysis - Rear SBL - Pressure Controlled time + 0.50 sec +/- + 0.2 sec	Run Count : 1	
October 27, 2016 13:24:01	Start	Execution	Instr Pressure Detail - Back SBL - Pressure Controlled time + 0.50 sec +/- + 0.2 sec and + 0.5 sec	None	
October 27, 2016 13:24:01	End	Execution	Instr Pressure Detail - Back SBL - Pressure Controlled time + 0.50 sec +/- + 0.5 sec and + 0.5 sec	Run Count : 1	
October 27, 2016 13:24:01	End	Execution	Instr Pressure Analysis - Back SBL - Pressure Controlled time + 0.50 sec +/- + 0.2 sec and + 0.5 sec	None	
October 27, 2016 13:24:01	End	Execution	Instr Pressure Analysis - Back SBL - Pressure Controlled time + 0.50 sec +/- + 0.2 sec	Run Count : 1	
October 27, 2016 13:24:01	Start	Execution	Default User Feedback FED - Type "Feedback" mSec(s) = 10 mSec	None	

Date: October 22, 2024 9:27:05 AM
System ID: OC-8_C0011401066

[illegible]

Date: October 22, 2024 9:27:05 AM
System ID: GC-8_OH1461000

[illegible]

Date: October 22, 2024 9:27:05 AM
System ID: OC-6_CW11401008

[illegible]

Date: October 22, 2024 9:27:05 AM
System ID: GC-E_CNF1461058

Live Events - unapproved for release				System ID: OC-2019-01008	
Report Generated by Nemoans: LAPTOP-CD32609Y				Print Date: 2019-07-20 14:27:00 AM	
JSDA_AIA_OC-2019-01008_SOW Transaction Log					
Date	Transaction Type	Transaction Status	Type of Transaction	Optional Information	
October 22, 2019 03:40:40	End	Completed	OC Scouting Run - Scouting Trans: From SBL, From FPD - Part of System Preparation Not manually accounted	None	
October 22, 2019 03:46:46	Auto	Data	OC Scouting Run - Scouting Trans: From SBL, From FPD - Part of System Preparation Not manually accounted	Data Path: C:\Data\unapproved\OC2019-01008\Part of System Preparation\FPD\AIA	
October 22, 2019 03:47:05	End	Execution	OC Scouting Run - Scouting Trans: From SBL, From FPD - Part of System Preparation Not manually accounted	Run: Check 1	
October 22, 2019 03:47:30	Start	Auto	Heater and DBT - From FPD Heater FPD - 1 (Power) = 0.1 W @ 0.000 @ 1.00 g/min	None	
October 22, 2019 03:48:00	Auto	Data	Heater and DBT - From FPD Heater FPD - 1 (Power) = 0.1 W @ 0.000 @ 1.00 g/min	Data Path: C:\Data\unapproved\OC2019-01008\Heater FPD\AIA	
October 22, 2019 03:48:07	End	Execution	Heater and DBT - From FPD Heater FPD - 1 (Power) = 0.1 W @ 0.000 @ 1.00 g/min	Run: Check 1	
October 22, 2019 03:48:30	Auto	Execution	Vaporizer Reaction - Scouting Trans: From SBL, From FPD - 1 (A) @ 0.000 @ 3.00 W @ 0.000 @ 1.00 W	None	
October 22, 2019 03:49:00	Auto	Data	Countdown	Countdown timer is in data verification state	

Date: October 22, 2024 9:27:05 AM
System ID: GC-B_CN11491068

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ACC-100-10-2023
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REVIEW BY: *Manish P*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 21/1/26

Certificate Number

CWS-002-06

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer

MANUFACTURER : Novatek

MODEL/TYPE : Sensor: WS-02P

SERIAL NUMBER : Data logger: 130-W5-250L-D

Q NUMBER : Sensor: WS0-A500

Q NUMBER AS-RECEIVED : Data logger: AS05

CUSTOMER : RMC, 70545

USED FOR : Used for: A12 Laboratory group (Thailand) Co., Ltd.

RECEIVED DATE : 11 Jul 2023

MEASUREMENT DATE : 11 Jul 2023

ISSUE DATE : 11 Jul 2023

ENVIRONMENTAL CONDITIONS : Ambient condition in the laboratory are as follows:

Temperature	(23.0 ± 0.5) °C
Relative Humidity	(55.0 ± 3.0) %RH
Atmospheric Pressure	(1010 ± 0.2) hPa

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

CALIBRATION CONDITIONS : Wind tunnel cross section area: 300 cm²

Wind direction: Upwind (up): 300 cm²

Diameter of measuring pipe: 1.25 cm

Blockage ratio of test object: 0.111

Preconditioning : 24 hours at ambient conditions.

Measurement Condition : The average values during measurement are (23.0 °C, 55.0 %RH and 1010.2 hPa).

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

Calibrated by: 23 Mr. Somrak Thachad

23 Mrs. Rungroj Poomsri

Approved signature: *[Signature]*

Mr. Panyaporn Booncharoen
Calibration Department Manager

Calibration procedure : The cup anemometer was calibrated against standard air velocity transducer against 8000 L/s and after data with precision differential pressure meter model (PMS02) in air flow with surface of effort type wind tunnel with 300 cm² cross section area. The WS-02P Sensor (4-20 mA) was used for data logging.

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.

Remarks : Calibration results only used for the stated circumstances and environmental conditions during which calibration took place.

* Validity of standard

* Validity of latest 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 sensor may differ from the calibrated one. The proportion of the set-up is not 1:1 with the calibrated one.

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



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REVIEW BY: *Manish P*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 21/1/26

Certificate Number

CWS-002-06

CERTIFICATE OF CALIBRATION

Page 2 of 2 Pages

MEASUREMENT RESULTS : The cup anemometer, Unit Under Calibration (UUC) was exercised at 0.2 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.2 m/s to 1 m/s was calculated by a standard air velocity transducer and shown 1 m/s to 10 m/s was calculated by a pitot tube with precision differential pressure meter which was installed at 40 mm and 300 mm respectively from the wind tunnel nozzle. UUC was installed at center of the test section. The calibration was carried out under both along and falling air velocity in the range of 1 m/s to 10 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below:

UUC (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	UUC (m/s)	Error (m/s)	U (m/s)	U (m/s)
1.029	23.00	23.00	0.9	-0.3	0.3	0.3
1.079	23.00	23.00	1.0	-0.3	0.3	0.3
1.021	23.79	23.90	2.0	-0.3	0.3	0.3
1.140	23.00	23.00	3.0	-0.3	0.3	0.3
1.000	23.00	23.00	4.0	-0.3	0.3	0.3
1.000	23.00	23.00	5.0	-0.3	0.3	0.3
1.000	23.00	23.00	6.0	-0.3	0.3	0.3
1.000	23.00	23.00	7.0	-0.3	0.3	0.3
1.000	23.00	23.00	8.0	-0.3	0.3	0.3
1.000	23.79	23.90	9.0	-0.3	0.3	0.3
1.111	23.00	23.00	10.0	-0.3	0.3	0.3
1.111	23.79	23.90	11.0	-0.3	0.3	0.3
1.111	23.00	23.00	12.0	-0.3	0.3	0.3
1.111	23.00	23.00	13.0	-0.3	0.3	0.3
1.111	23.00	23.00	14.0	-0.3	0.3	0.3
1.111	23.00	23.00	15.0	-0.3	0.3	0.3
1.111	23.00	23.00	16.0	-0.3	0.3	0.3

Remarks : Calibration results only used for the stated circumstances and environmental conditions during which calibration took place.

* Validity of standard

* Validity of latest 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 sensor may differ from the calibrated one. The proportion of the set-up is not 1:1 with the calibrated one.



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REVIEW BY: *Manish P*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 21/1/26

Certificate Number

CWS-002-06

CERTIFICATE OF CALIBRATION

Page 2 of 2 Pages

MEASUREMENT RESULTS : The wind direction sensor was calibrated against standard rotary anemometer by comparison method. During calibration, the measurement was carried out at 4° intervals in clockwise and counter-clockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 1 m/s) is kept constant while the sensor is rotated around to vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below:

Air speed (m/s)	UUC (Degree °)	UUC (Degree °)	Error (Degree °)	U (Degree °)	U (Degree °)
40.000	42	42	-1	1.0	1.0
40.000	87	87	-2	1.0	1.0
135.000	133	133	-2	1.0	1.0
180.000	181	181	1	1.0	1.0
225.000	229	229	4	1.0	1.0
270.000	276	276	1	1.0	1.0
315.000	327	327	2	1.0	1.0
360.000	359	359	1	1.0	1.0

Remarks : Calibration results only used for the stated circumstances and environmental conditions during which calibration took place.

* Validity of standard

* Validity of latest Calibration

PHOTO OF CALIBRATION SET-UP : 

Calibration set-up of the wind direction sensor calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The wind direction sensor may differ from the calibrated one. The proportion of the set-up is not 1:1 with the calibrated one.



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REVIEW BY: *Manish P*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 21/1/26

Certificate Number

COT-038-06

CERTIFICATE OF CALIBRATION

Page 2 of 2

Equipment Name : Data Logger with Temperature sensor

Manufacturer : Novatek

Model : 130-W5-250L-D

Serial No. : AS05

ID No. : RY0-F50545

Customer : A12 Laboratory group (Thailand) Co., Ltd.

Address : 104 Phatthanasarn Rd., Phatthanasarn Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10500 Thailand.

Received date : 11 Jul 2023

Calibration date : 21 Jul 2023

Issue date : 21 Jul 2023

Reference Used During Calibration : 1. Standard Temperature Probe Model: STS-220-A500, Serial No.: 867802-05, Due date: 28 Mar 2024
2. Digital Temperature Indicator Model: DTI-1000-A MK II, Serial No.: 671407-00591, Due date: 22 July 2023

Calibration Condition : Temperature: (23.0 ± 0.5) °C
Relative Humidity: (55.0 ± 3.0) %RH

Calibration Procedure : The temperature calibration was done by In-House. The measurement results are traceable to the calibration method in SI-02-001, according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature probe was used as ITS-90.

Traceability : The measurement results are traceable to the calibration method in SI-02-001, according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature probe was used as ITS-90.

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

Calibrated by: 23 Mr. Somrak Thachad

23 Mrs. Rungroj Poomsri

Approved signature: *[Signature]*

Mr. Panyaporn Booncharoen
Calibration Department Manager

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REVIEW BY: *Manish P*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 21/1/26

Certificate Number

CWS-002-06

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind direction sensor

MANUFACTURER : Novatek

MODEL/TYPE : Sensor: WS-02P

SERIAL NUMBER : Data logger: 130-W5-250L-D

Q NUMBER : Sensor: WS0-A500

Q NUMBER AS-RECEIVED : Data logger: AS05

CUSTOMER : Used for: A12 Laboratory group (Thailand) Co., Ltd.

RECEIVED DATE : 11 Jul 2023

MEASUREMENT DATE : 11 Jul 2023

ISSUE DATE : 11 Jul 2023

ENVIRONMENTAL CONDITIONS : Ambient condition in the laboratory are as follows:

Temperature	(23.0 ± 0.5) °C
Relative Humidity	(55.0 ± 3.0) %RH
Atmospheric Pressure	(1010 ± 0.2) hPa

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

CALIBRATION CONDITIONS : Wind tunnel cross section area: 300 cm²

Wind direction: Upwind (up): 300 cm²

Diameter of measuring pipe: 1.25 cm

Blockage ratio of test object: 0.111

Preconditioning : 24 hours at ambient conditions.

Measurement Condition : The average values during measurement are (23.0 °C, 55.0 %RH and 1010.2 hPa).

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

Calibrated by: 23 Mr. Somrak Thachad

23 Mrs. Rungroj Poomsri

Approved signature: *[Signature]*

Mr. Panyaporn Booncharoen
Calibration Department Manager

Calibration procedure : The wind direction sensor was calibrated against standard rotary anemometer by comparison method. During calibration, the measurement was carried out at 4° intervals in clockwise and counter-clockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 1 m/s) is kept constant while the sensor is rotated around to vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below:

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.

Remarks : Calibration results only used for the stated circumstances and environmental conditions during which calibration took place.


* Validity of standard

* Validity of latest Calibration

PHOTO OF CALIBRATION SET-UP : 

Calibration set-up of the wind direction sensor calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The wind direction sensor may differ from the calibrated one. The proportion of the set-up is not 1:1 with the calibrated one.

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



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REVIEW BY: *Manish P*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 21/1/26

Certificate Number

COT-038-06

CERTIFICATE OF CALIBRATION

Page 2 of 2

Result of Calibration : 22 Without Adjustment 23 With Adjustment

Calibration Range : 20-40 °C


Function : This equipment was connected with temperature sensor Model: HMP90 S/N: T2320595.

Dimension : Diameter 12 mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.060	19.6	-0.5	0.009
70	20.060	24.6	-0.4	0.14
70	30.060	29.7	-0.4	0.009
70	35.043	34.9	-0.5	0.009
70	40.036	39.5	-0.5	0.009

UUC : Unit Under Calibration

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

End of Certificate : 

Calibrated by: 23 Mr. Somrak Thachad

23 Mrs. Rungroj Poomsri

Approved signature: *[Signature]*

Mr. Panyaporn Booncharoen
Calibration Department Manager

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CERTIFICATE OF CALIBRATION

Calibration No.: JN-07072023
Page 1 of 1 Page

Measurement Item: Relative humidity with data logger
Manufacturer: Novint
Model/Type: 110-W5-250L-D
Serial Number: A5810
ID No.: RYD_750045
Customer: A.S. Laboratory group (Thailand) Co., Ltd.
104 Phuthanukun 40, Phuthanukun Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition:
The measurement was carried out in an ambient temperature of (25±3)°C and relative humidity of (50±10)%.

Measurement Method:
Unit Under Calibration (UUC) was calibrated by comparison method with standard chilled mirror hygrometer model: 1840-2 in the humidity generator chamber to determine the error.

Traceability:
This instrument was calibrated using standard equipment whose accuracy is traceable through National Institute of Standards and Technology to the international system of units (SI) via NIST Calibration, Inc. Certificate number 20929-601. Due date: Sep 26, 2024.

Measurement Date: Jul 21, 2023
Issue Date: Jul 21, 2023

Measurement Results:
This equipment was connected with indoor air quality probe and Displayed SFR on display Model: HMP100, Serial number: T3030695.
Calibration was performed in the range of 20%RH to 80%RH.
The results of calibration are reported in table below.

Calibration	Standard showing	UUC showing	Error	Uncertainty
(%RH)	(%RH)	(%RH)	(%RH)	(%RH)
20	20.05	17.5	-2.5	0.50
50	50.23	46.5	-3.7	0.51
80	80.75	75.5	-5.2	0.51

Performed by:
☒ Mr. Sornwat Thachai
☒ Miss Jiraporn Lamsangthai
☒ Miss Ruangsri Promsilp
Approved Signature: Mr. Panyas Boonchuan
Calibration Department Manager

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Accredited calibration laboratory
ISO/IEC 17025:2017
ACC 150-FR-17025
CALIBRATION 0367

All speed measurement laboratory
Calibration services department



Calibration Number
C0-025-06

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

Measurement Item: Air speedometer
Manufacturer: Novint
Model/Type: Sensor WS-02FA
Serial Number: Data logger: 110-W5-250L-D
Sensor: W50-A580
Data logger: A5800
ID Number: RYD_750045
Condition as received: New item
Customer: A.S. Laboratory group (Thailand) Co., Ltd.
104 Phuthanukun 40, Phuthanukun Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE: 14 Jun 2023
MEASUREMENT DATE: 10 Jun 2023
ISSUE DATE: 10 Jun 2023

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follows:
Temperature: 25.0 ± 1.0 °C
Relative humidity: 50.0 ± 1.0 %RH
Atmospheric Pressure: 1013 ± 10 hPa

PLACE OF CALIBRATION: 104 Phutthamonkiet road of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS:
Wind tunnel cross section area: 900 cm²
Wind direction (upstream): 100 cm²
Diameter of rotating prop: 100 mm
Blockage ratio of test object: 0.111

Preconditioning:
Measurement Condition: 24 hours at ambient conditions.
The average values during measurement are (24.4)°, (41.8)°N and (100.1)°N.

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

Calibrated by:
☒ Mr. Sornwat Thachai
☒ Miss Jiraporn Lamsangthai
Approved Signature: Mr. Panyas Boonchuan
Calibration Department Manager

Remarks:
* Only calibration area of the wind tunnel
* Possible cross-section area of the tested object within mounting plate
* Diameter of mounting plate
* Note: 1/1

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Accredited calibration laboratory
ISO/IEC 17025:2017
ACC 150-FR-17025
CALIBRATION 0367

All speed measurement laboratory
Calibration services department

Calibration Number
C0-025-06

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

Measurement Item: Wind direction sensor
Manufacturer: Novint
Model/Type: Sensor WS-02FA
Serial Number: Data logger: 110-W5-250L-D
Sensor: W50-A580
Data logger: A5800
ID Number: RYD_750045
Condition as received: New item
Customer: A.S. Laboratory group (Thailand) Co., Ltd.
104 Phuthanukun 40, Phuthanukun Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE: 14 Jun 2023
MEASUREMENT DATE: 10 Jun 2023
ISSUE DATE: 10 Jun 2023

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follows:
Temperature: 25.0 ± 1.0 °C
Relative humidity: 50.0 ± 1.0 %RH
Atmospheric Pressure: 1013 ± 10 hPa

PLACE OF CALIBRATION: 104 Phutthamonkiet road of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS:
Wind tunnel cross section area: 900 cm²
Wind direction (upstream): 100 cm²
Diameter of rotating prop: 100 mm
Blockage ratio of test object: 0.111

Preconditioning:
Measurement Condition: 24 hours at ambient conditions.
The average values during measurement are (24.3)°, (41.4)°N and (100.0)°N.

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

Calibrated by:
☒ Mr. Sornwat Thachai
☒ Miss Jiraporn Lamsangthai
Approved Signature: Mr. Panyas Boonchuan
Calibration Department Manager

Remarks:
* Only calibration area of the wind tunnel
* Possible cross-section area of the tested object within mounting plate
* Diameter of mounting plate
* Note: 1/1

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CERTIFICATE OF CALIBRATION

Calibration No.: C1-025-06
Page 1 of 2

Equipment Name: Data Logger with Temperature sensor
Manufacturer: Novint
Model: 110-W5-250L-D
Serial No.: A5800
ID No.: RYD_750045

Customer: A.S. Laboratory group (Thailand) Co., Ltd.
Address: 104 Phuthanukun 40, Phuthanukun Rd,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Received date: 10 Jun 2023
Calibration date: 20 Jun 2023
Issue date: 22 Jun 2023

Reference Used During Calibration:
1. Standard Temperature Probe Model: ITS-100 A500,
Serial No.: 687893-09, Due date: 28 Mar 2024
2. Digital Temperature Indicator Model: DT1-1000A MK II,
Serial No.: 671407-005951 Due date: 22 July 2023

Calibration Condition:
Temperature: (23±0.5)°C
Relative Humidity: (55±15)%

Calibration Procedure:
The temperature calibration was done by 1-hour calibration method as per CL-001, according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale was based on ITS-90.

Traceability:
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0538-23, Certificate number: CR-0092-22

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

Calibrated by:
☒ Mr. Sornwat Thachai
☒ Miss Jiraporn Lamsangthai
☒ Miss Ruangsri Promsilp

Approved Signature: Mr. Panyas Boonchuan
Calibration Department Manager

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63/14-15.67/35-36, Soi Petchkasem 7/71, Petchkasem Rd.
Wathapra, Bangkok, Thailand 10600
Tel: (66) 02-660812813 Fax: (66) 02-6608060 www.jiranatee.com

Certificate No.: CF-025-66
Page 2 of 2


Result of Calibration: ☒ Without Adjustment ☐ With Adjustment
Calibration Range: 20-40 °C

Function:
This equipment was connected with temperature sensor Model: HMP90 S/N: V1920214.
Dimension: Diameter 12 mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.057	20.0	-0.1	0.099
70	25.051	24.9	-0.2	0.099
70	30.044	29.8	-0.2	0.099
70	35.039	34.8	-0.2	0.099
70	40.034	39.7	-0.3	0.099

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

★ End of Certificate ★



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Certificate No.: 193-09062023
Page 1 of 1 Page

CERTIFICATE OF CALIBRATION

Measurement Item: Relative Humidity with data logger
Manufacturer: Humidity
Model/Type: 110 WS-250C-D
Serial Number: A2880
ID No.: P100 P20049
Customer: ALB laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition:
The measurement was carried out in an ambient temperature of 25±0.3°C and relative humidity of 50±10%.

Measurement Method:
Unit Under Calibration (UUC) was calibrated by comparison method with standard chilled mirror hygrometer model: 1860-3 in the humidity generator chamber to determine the errors.

Traceability:
This instrument was calibrated using standard equipment whose accuracy is traceable through National Institute of Standards and Technology to the international system of units (SI) via MCS Calibration, Inc. Certificate number: 20920-601. Due date: Sep 26, 2024.

Measurement Date: Jun 20, 2023
Issued Date: Jun 22, 2023

Measurement Result:
This equipment was connected with indoor air quality probe and Displayed RH% on display. Model: HMP60, Serial number: V10700214.
Calibration was performed in the range of 20%RH to 80%RH.
The results of calibration are reported in table below.

Determined (RH%)	Standard (RH%)	UUC (RH%)	Error (RH%)	Uncertainty (RH%)
20	20.04	19.5	-0.7	0.52
50	50.25	49.5	-0.8	0.52
80	80.35	80.5	0.2	0.52

Performed by: ☒ Mr. Sorwatt Thachakul
☒ Miss Jiraporn Lertanaphol
☒ Miss Ruangsri Phasomthorn

Approved Signature: 
Mr. Pinyas Booncharoen
Calibration Department Manager

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Tel: (66) 02-660812813 Fax: (66) 02-6608060 www.jiranatee.com

Certificate No.: CF-025-66
Page 1 of 2 Pages

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM: Digital thermometer
MANUFACTURER: HANNA
Model/Type: HI-9142
SERIAL NUMBER: 150 WS-250C-D
ID NUMBER: A1580
CONDITION AS-RECEIVED: HI-9142
CUSTOMER: New Item
All laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE: 15 Jun 2023
MEASUREMENT DATE: 20 Jun 2023
ISSUE DATE: 20 Jun 2023

Calibration procedure:
The pressure transducer was checked by pressure calibration method by H2O vapor according to measurement method with digital pressure calibrator before on DATE 6.2

Traceability:
The measurement results are traceable to the international system of units (SI) through the NMPT (National Metrology Institute of Thailand) by Certificate number: MP-0205-22

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

CONDITION OF THIS RESULT OF CALIBRATION:
1. Reference Standard Instrument:
Instrument: Model: Serial No.: Certificate No.: Start Date:
Absolute Pressure Transducer: CP21500: 4101240: MP-0205-22: 03 Dec 2023

2. Calibration conditions:
a. Condition: ☒ Normal ☐ Abnormal
Pressure transmitting medium: Air
Pressure transmitting medium: 1.29 kg/m³
T: 15.0°C ± 1 bar
P: 1013.25 hPa
T: 15.0°C ± 1 bar
P: 1013.25 hPa

3. The certificate is valid only for the time stated on date and place of calibration.

Calibrated by: ☒ Mr. Sorwatt Thachakul
☒ Miss Jiraporn Lertanaphol

Approved Signature: 
Mr. Pinyas Booncharoen
Calibration Department Manager

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Certificate No.: CF-025-66
Page 2 of 2 Pages

CERTIFICATE OF CALIBRATION

MEASUREMENT RESULTS: ☒ Without adjustment ☐ With adjustment
CALIBRATION IN THE RANGE OF: 1950 mbar to 1050 mbar

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

STD (mbar)	UUC* (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
950.33	950.5	0.4	0.84
970.04	970.4	0.4	0.86
990.35	990.3	0.2	0.46
1010.08	1010.1	0.0	0.37
1030.30	1029.8	-0.5	0.50
1050.08	1049.5	-0.6	0.75

Note: UUC* Unit Under Calibration
To convert the result in report unit to SI should be multiply by 100

★ End of certificate ★



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Certificate No.: 193-09062023
Page 1 of 1 Page

CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM: Cup anemometer
MANUFACTURER: HANNA
Model/Type: HI-9142
SERIAL NUMBER: 150 WS-250C-D
ID NUMBER: A1580
CONDITION AS-RECEIVED: HI-9142
CUSTOMER: New Item
All laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE: 14 Jun 2023
MEASUREMENT DATE: 19 Jun 2023
ISSUE DATE: 19 Jun 2023

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follows:
Temperature: 23.0 ± 0.3 °C
Relative Humidity: 50.0 ± 5.0 %RH
Atmospheric Pressure: 1013.25 ± 0.1 hPa

PLAC OF CALIBRATION: 104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

CALIBRATION CONDITIONS:
Wind speed measurement area: 100 mm
Wind direction: 100 mm
Diameter of measuring pipe: 100 mm
Height of measuring pipe: 100 mm

Preconditioning:
Measurement Condition: 24 hours in ambient conditions.
The average values during measurement are 25.0 °C, 63.1 %RH and 1013.1 hPa.

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

Calibrated by: ☒ Mr. Sorwatt Thachakul
☒ Miss Jiraporn Lertanaphol

Approved Signature: 
Mr. Pinyas Booncharoen
Calibration Department Manager

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Certificate No.: 193-09062023
Page 1 of 2 Pages

CERTIFICATE OF CALIBRATION

MEASUREMENT RESULTS:
The cup anemometer, Unit Under Calibration (UUC) was checked at 10 m/s for 1 minute prior to calibration being performed. The standard air velocity 0.3 m/s was calibrated by a standard air velocity transducer and above 1 m/s to 10 m/s was calibrated by a pitot tube with precision differential pressure meter which was calibrated at 10 m/s and 10 m/s was respectively above from wind tunnel inside. UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 10 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

Std (m/s)	Temp wind tunnel (m/s)	Temp. wind (m/s)	UUC (m/s)	Error (m/s)	Uncertainty (k=2) (m/s)
1.025	10.00	10.00	0.0	-0.1	0.11
1.025	10.00	10.00	0.0	-0.1	0.11
2.050	20.00	20.00	0.0	-0.1	0.22
3.075	30.00	30.00	0.0	-0.1	0.33
4.100	40.00	40.00	0.0	-0.1	0.44
5.125	50.00	50.00	0.0	-0.1	0.55
6.150	60.00	60.00	0.0	-0.1	0.66
7.175	70.00	70.00	0.0	-0.1	0.77
8.200	80.00	80.00	0.0	-0.1	0.88
9.225	90.00	90.00	0.0	-0.1	0.99
10.250	100.00	100.00	0.0	-0.1	1.10
11.275	110.00	110.00	0.0	-0.1	1.21
12.300	120.00	120.00	0.0	-0.1	1.32
13.325	130.00	130.00	0.0	-0.1	1.43
14.350	140.00	140.00	0.0	-0.1	1.54
15.375	150.00	150.00	0.0	-0.1	1.65
16.400	160.00	160.00	0.0	-0.1	1.76

Note:
1. Calibration was performed in the laboratory conditions and environmental conditions were as follows:
2. Uncertainty of standard
3. Uncertainty of Unit Under Calibration

PHOTO OF CALIBRATION SET UP



Calibration setup of the cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The cup anemometer shows may differ from the calibration one. However, the proportion of the cup up to is not too large due to imaging geometry.

★ End of certificate ★



MEASUREMENT ITEM	Measurement Service		Calibration procedure:	
MANUFACTURER	iMondel		The standard version was supplied against	
MODEL TYPE	iMondel 3000-001		British Army Standard weight, 4.53025 kg	
	Serial No. 1014		DIN EN 10370-1 as cited in BS EN 10370-1	
UNIT NUMBER	Serial No. 1014		The unit was used with 200 g 1000 g and 5000 g weights	
	Serial No. 1014		The 5000 g calibration is of BS EN 10370-1	
10 NUMBER	Serial No. 1014		and using automatic function, 1 part in 1000	
CONDITION AS RECEIVED	PPE, 1000 g		Performance measurements of automatic	
CUSTOMER	UK Ministry of Defence (Thameside Co, 105 100 Portsmouth Rd, Portsmouth PO1 1SR, Hampshire, UK)		weighting were performed, March 2017 were used as a performance procedure.	
	800 Sun Loang, Bangkok 10250 Thailand.			
ISSUED DATE	18th Aug 2014		Integrity:	
MEASUREMENT DATE	11 Jan 2014		This instrument is a possession of the	
DATE	11 Jan 2014		Department, recognised the measurement	
			principles, and to maintain the instrument	
			calibrated by 10 through the ARSIP	
			Institute of Thailand on Calibration	
			Service (20-05-2014)	
ENVIRONMENTAL CONDITIONS			Uncertainty of Measurement:	
Relative conditions in the laboratory are as follows:			The reported uncertainty of measurement is	
Temperature	18.0 ± 0.5	°C	based on the combined uncertainty evaluated by	
Humidity	50.0 ± 0.8	%	example factor k=1, which for a normal	
Atmospheric Pressure	1013.0 ± 3	mPa	distribution is approximately 95% of	
			of approximately 70%, standard for	
			the evaluation of measurement data.	
PLACE OF CALIBRATION	1-040-type road in the Department Area (A, 10)		Evaluation of measurement data – Guide to the	
			expression of uncertainty in measurement	
LABORATION CONDITION	1000 Standard mass (calibrated) 1000			
	Weight direction (calibrated) 1.28			
	Direction of reading (g) 0.000			
	Mass (g) of 1000 g 0.001			
Reassessing	12 hours after of typical conditions.			
General	1000 g Standard mass (calibrated) are 100.027, 100.029, 100.030 and 100.031 g.			

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

Cellaried by:
☒ Mr. Jarrett Thibault
☐ Miss (Therese) LeBlond

Keywords:
 1. Ridge with position away of the hand barrel
 2. Angled over on the area of the hand barrel include mounting pipe
 3. Examples of mounting pipe
 4. *Keywords:*

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Page 2 of 1 Pages

Result of Calibration:	GF Without Adjustment	GF With Adjustment
1. $\text{GF} = 0.0000$	0.0000	0.0000
2. $\text{GF} = 0.0001$	0.0001	0.0000
3. $\text{GF} = 0.0002$	0.0002	0.0000
4. $\text{GF} = 0.0003$	0.0003	0.0000
5. $\text{GF} = 0.0004$	0.0004	0.0000
6. $\text{GF} = 0.0005$	0.0005	0.0000
7. $\text{GF} = 0.0006$	0.0006	0.0000
8. $\text{GF} = 0.0007$	0.0007	0.0000
9. $\text{GF} = 0.0008$	0.0008	0.0000
10. $\text{GF} = 0.0009$	0.0009	0.0000
11. $\text{GF} = 0.0010$	0.0010	0.0000
12. $\text{GF} = 0.0011$	0.0011	0.0000
13. $\text{GF} = 0.0012$	0.0012	0.0000
14. $\text{GF} = 0.0013$	0.0013	0.0000
15. $\text{GF} = 0.0014$	0.0014	0.0000
16. $\text{GF} = 0.0015$	0.0015	0.0000
17. $\text{GF} = 0.0016$	0.0016	0.0000
18. $\text{GF} = 0.0017$	0.0017	0.0000
19. $\text{GF} = 0.0018$	0.0018	0.0000
20. $\text{GF} = 0.0019$	0.0019	0.0000
21. $\text{GF} = 0.0020$	0.0020	0.0000
22. $\text{GF} = 0.0021$	0.0021	0.0000
23. $\text{GF} = 0.0022$	0.0022	0.0000
24. $\text{GF} = 0.0023$	0.0023	0.0000
25. $\text{GF} = 0.0024$	0.0024	0.0000
26. $\text{GF} = 0.0025$	0.0025	0.0000
27. $\text{GF} = 0.0026$	0.0026	0.0000
28. $\text{GF} = 0.0027$	0.0027	0.0000
29. $\text{GF} = 0.0028$	0.0028	0.0000
30. $\text{GF} = 0.0029$	0.0029	0.0000
31. $\text{GF} = 0.0030$	0.0030	0.0000
32. $\text{GF} = 0.0031$	0.0031	0.0000
33. $\text{GF} = 0.0032$	0.0032	0.0000
34. $\text{GF} = 0.0033$	0.0033	0.0000
35. $\text{GF} = 0.0034$	0.0034	0.0000
36. $\text{GF} = 0.0035$	0.0035	0.0000
37. $\text{GF} = 0.0036$	0.0036	0.0000
38. $\text{GF} = 0.0037$	0.0037	0.0000
39. $\text{GF} = 0.0038$	0.0038	0.0000
40. $\text{GF} = 0.0039$	0.0039	0.0000
41. $\text{GF} = 0.0040$	0.0040	0.0000
42. $\text{GF} = 0.0041$	0.0041	0.0000
43. $\text{GF} = 0.0042$	0.0042	0.0000
44. $\text{GF} = 0.0043$	0.0043	0.0000
45. $\text{GF} = 0.0044$	0.0044	0.0000
46. $\text{GF} = 0.0045$	0.0045	0.0000
47. $\text{GF} = 0.0046$	0.0046	0.0000
48. $\text{GF} = 0.0047$	0.0047	0.0000
49. $\text{GF} = 0.0048$	0.0048	0.0000
50. $\text{GF} = 0.0049$	0.0049	0.0000
51. $\text{GF} = 0.0050$	0.0050	0.0000
52. $\text{GF} = 0.0051$	0.0051	0.0000
53. $\text{GF} = 0.0052$	0.0052	0.0000
54. $\text{GF} = 0.0053$	0.0053	0.0000
55. $\text{GF} = 0.0054$	0.0054	0.0000
56. $\text{GF} = 0.0055$	0.0055	0.0000
57. $\text{GF} = 0.0056$	0.0056	0.0000
58. $\text{GF} = 0.0057$	0.0057	0.0000
59. $\text{GF} = 0.0058$	0.0058	0.0000
60. $\text{GF} = 0.0059$	0.0059	0.0000
61. $\text{GF} = 0.0060$	0.0060	0.0000
62. $\text{GF} = 0.0061$	0.0061	0.0000
63. $\text{GF} = 0.0062$	0.0062	0.0000
64. $\text{GF} = 0.0063$	0.0063	0.0000
65. $\text{GF} = 0.0064$	0.0064	0.0000
66. $\text{GF} = 0.0065$	0.0065	0.0000
67. $\text{GF} = 0.0066$	0.0066	0.0000
68. $\text{GF} = 0.0067$	0.0067	0.0000
69. $\text{GF} = 0.0068$	0.0068	0.0000
70. $\text{GF} = 0.0069$	0.0069	0.0000
71. $\text{GF} = 0.0070$	0.0070	0.0000
72.		

Calibration Range: 20 °C to 40 °C

Function: Table 2. This equipment was connected with temperature sensor Model: HMP60 1/N; 54020631. Dimensions: Diameter 12 mm, Length 30 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
50	20.050	19.8	-0.4	0.009
50	25.053	24.6	-0.5	0.009
50	30.045	29.7	-0.3	0.009
50	35.036	34.5	-0.5	0.009
50	40.038	39.4	-0.6	0.009

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[end of Certificate of Calibration]



	Value	SD	Z	P-Value
0.00	195,000	183	-2	0.05
	180,000	161	1	0.80
	175,000	239	4	0.01
	270,000	279	3	0.02
	115,000	318	2	0.04

Remarks:

¹ Calibration results only valid for the tested circumstances and environmental conditions during which calibration was performed

² Direction of standard

³ Direction of test under Calibration

End of Evidence of Culture



Page 1 of 2 Pages

MEASUREMENT ITEM	Date Logger with Temperature sensor
MANUFACTURER	Nanalysys
MODEL/TYPE	110-WF-2SDL-D
SERIAL NUMBER	A5660
ID NUMBER	RYD_F30530
CONDITION AS-RECEIVED	Used Item
CUSTOMER	A&S Laboratory group (Thailand) Co., Ltd.

RECEIVED DATE	06 Aug 2024
MEASUREMENT DATE	21 Aug 2024
ISSUE DATE	21 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory
Temperature
Relative Humidity

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

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

Calculated by:

- ☐ Mr. Sothorn Thirathat
- ☒ Miss Sirasorn Lertsuangphol
- ☐ Miss Nuchgrasamee Phrasomrit

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Certification No. 1987-037-02

MEASUREMENT ITEM	Relative humidity with data log
MANUFACTURER	Niagara
MODEL/TYPE	Data Logger: 110-W5-25X-O Sensor: RH-PHD
SERIAL NUMBER	Data Logger: A5500 Sensor: 54630611
ID NUMBER	W5_135201

RECEIVED DATE	08 Aug 2024
MEASUREMENT DATE	21 Aug 2024
ISSUE DATE	21 Aug 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory was as follows:
Temperature: 23°C
Relative Humidity: 50%

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

☐ Mr. Jerald Threlkeld
☒ Mr. Stephen Lathrop
☐ Mr. Kenneth Plummer

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Page 2 of 2 Pages

Measurement Results

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

Result of Collection: ☒ Without Adjustment ☐ With Adjustment

Table 3. The results of calibration of relative humidity at 30 °C are reported in table below
Calibration Range: 22%RH to 97%RH

Air Temperature (°C)	Standard Reading (pale)	SOI Reading (pale)	Iron (pale)	Moisture (pale)
29.83	19.61	17.6	3.8	0.01
30.88	19.72	18.0	3.7	1.3
30.47	22.54	18.5	4.6	1.8

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End of Certificate of Collection



CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER: Cup anemometer

MODEL/TYPE: Sensor WS-02FA

SERIAL NUMBER: Data logger 120 WS-250L-D

ID NUMBER: Sensor: WS0-A088

CONDITION AS RECEIVED: Data logger: A088

CUSTOMER: 100 Phatthanasak Rd., 10th Floor, Bangkok 10100, Thailand

RECEIVED DATE: 18 Jun 2023

MEASUREMENT DATE: 20 Jun 2023

ISSUE DATE: 20 Jun 2023

ENVIRONMENTAL CONDITIONS

Ambient condition in the laboratory are as follows:

Temperature: 23.0 ± 0.5 °C

Relative Humidity: 55.0 ± 2.0 %RH

Atmospheric Pressure: 1020 ± 10 hPa

PLACE OF CALIBRATION

Effect type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

Wind tunnel cross section area: 900 cm²

Wind direction (upstream): 180°

Diameter of measuring pipe: 10 mm

Blockage ratio of test object: 0.111

Preconditioning

24 hours at ambient conditions.

Measurement Condition

The average values during measurement are (24.8, 6.1, 144.7) m/s and (1008.5) hPa.

TABULATION OF RESULTS

The table on next page give the measured values.

Calibrated by: ☒ Mr. Somrak Thacharad
☒ Miss Jitaporn Lertbongkhit

Approved signature: *[Signature]* Mr. Pankaj Booncharoen
Calibration Department Manager

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Page 2 of 2 Pages

MEASUREMENT RESULTS¹

u _{ref} [m/s]	Temp. wind tunnel [°C]	Temp. room [°C]	u _{ref} [m/s]	Error [m/s]	U _{95%} [m/s]
1.020	24.50	24.50	1.0	-0.1	0.1
2.020	24.50	24.50	1.9	-0.1	0.1
3.020	24.50	24.50	2.8	-0.1	0.1
4.020	24.50	24.50	3.7	-0.1	0.1
5.020	24.50	24.50	4.6	-0.1	0.1
6.020	24.50	24.50	5.5	-0.1	0.1
7.020	24.50	24.50	6.4	-0.1	0.1
8.020	24.50	24.50	7.3	-0.1	0.1
9.020	24.50	24.50	8.2	-0.1	0.1
10.020	24.50	24.50	9.1	-0.1	0.1
11.020	24.50	24.50	10.0	-0.1	0.1
12.020	24.50	24.50	10.9	-0.1	0.1
13.020	24.50	24.50	11.8	-0.1	0.1
14.020	24.50	24.50	12.7	-0.1	0.1
15.020	24.50	24.50	13.6	-0.1	0.1
16.020	24.50	24.50	14.5	-0.1	0.1

Remarks:

¹ Calibration results only valid for the tested parameters and environmental conditions during which calibration took place.

² Uncertainty of standard.

³ Uncertainty of this 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 only after from the calibration are shown. The photograph of the set-up is not shown for security reasons.

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CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER: Wind direction sensor

MODEL/TYPE: Sensor WS-02FA

SERIAL NUMBER: Data logger 120 WS-250L-D

ID NUMBER: Sensor: WS0-A088

CONDITION AS RECEIVED: Data logger: A088

CUSTOMER: 100 Phatthanasak Rd., 10th Floor, Bangkok 10100, Thailand

RECEIVED DATE: 18 Jun 2023

MEASUREMENT DATE: 20 Jun 2023

ISSUE DATE: 20 Jun 2023

ENVIRONMENTAL CONDITIONS

Ambient condition in the laboratory are as follows:

Temperature: 23.0 ± 0.5 °C

Relative Humidity: 55.0 ± 2.0 %RH

Atmospheric Pressure: 1020 ± 10 hPa

PLACE OF CALIBRATION

Effect type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS

Wind tunnel cross section area: 900 cm²

Wind direction (upstream): 180°

Diameter of measuring pipe: 10 mm

Blockage ratio of test object: 0.143

Preconditioning

24 hours at ambient conditions.

Measurement Condition

The average values during measurement are (24.8, 6.1, 144.7) m/s and (1008.5) hPa.

TABULATION OF RESULTS

The table on next page give the measured values.

Calibrated by: ☒ Mr. Somrak Thacharad
☒ Miss Jitaporn Lertbongkhit

Approved signature: *[Signature]* Mr. Pankaj Booncharoen
Calibration Department Manager

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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 4° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (speed) is 5 m/s in both directions 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} Degrees (°)	D _{ref} Degrees (°)	Error Degrees (°)	U _{95%} Degrees (°)
5.00	0	0	0	0.1
5.00	45.00	42	-3	0.1
5.00	90.00	87	-3	0.1
5.00	135.00	131	-4	0.1
5.00	180.00	179	-1	0.1
5.00	225.00	227	2	0.1
5.00	270.00	274	4	0.1
5.00	315.00	318	3	0.1

Remarks:

¹ Calibration results only valid for the tested parameters and environmental conditions during which calibration took place.

² Uncertainty of standard.

³ Uncertainty of this under calibration.

End of Certificate of Calibration

Calibrated by: ☒ Mr. Somrak Thacharad
☒ Miss Jitaporn Lertbongkhit
☒ Miss Ruangsri Poomsri

Approved signature: *[Signature]* Mr. Pankaj Booncharoen
Calibration Department Manager

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CERTIFICATE OF CALIBRATION

Certificate No.: CC-038-68
Page 1 of 2

Equipment Name: Data Logger with Temperature sensor

Manufacturer: Hukseflux

Model: 110-W5-250L-D

Serial No.: A088

ID No.: WS-06050

Customer: ALS laboratory group (Thailand) Co., Ltd.

Name: 104 Phatthanasak Rd., 10th Floor, Bangkok 10100, Thailand

Received date: 18 Jun 2023

Calibration date: 20 Jun 2023

Issue date: 22 Jun 2023

Reference Used During Calibration:

1. Standard Temperature Probe Model: STS-100 A500, Serial No.: 667862-09, Due date: 28 Mar 2024

2. Digital Temperature Indicator Model: DT-1000-A Mk. II, Serial No.: 671407-00561 Due date: 22 July 2023

Calibration Condition:

Temperature: (23±1) °C

Relative Humidity: (55±15)%

Traceability:

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology (Thailand) (NIMT) Certificate number: TT-0038-23, Certificate number: 0N-0002-22

Calibration Procedure:

The measurement results were done by in-house calibration method as WS-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale was based on ITS-90.

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

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Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

This equipment was connected with temperature sensor Model: HMP06 B/N VL920225.

Dimension: Diameter 22 mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading [°C]	UUC Reading [°C]	Error [°C]	Uncertainty [°C]
70	20.058	20.0	-0.1	0.099
70	25.051	24.9	-0.2	0.099
70	30.044	29.8	-0.2	0.099
70	35.039	34.8	-0.2	0.099
70	40.034	39.7	-0.3	0.099

UUC¹: Unit Under Calibration

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

End of Certificate

Calibrated by: ☒ Mr. Somrak Thacharad
☒ Miss Jitaporn Lertbongkhit
☒ Miss Ruangsri Poomsri

Approved signature: *[Signature]* Mr. Pankaj Booncharoen
Calibration Department Manager

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63/14-15,67/35-36, Soi Petchasem 7/71, Petchasem Rd,
Walthapa, Bangkok 10000 Thailand.
Tel: (66) 02-6680812#13 Fax: (66) 02-6680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Calibration No. : RA-00042023
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger
Manufacturer : Novatek
Model/Type : I110-WB-250L-D
Serial Number : A3098
ID No. : RYD_730640
Customer : A.S. Laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd, Khwaeng San Luang, Khet San Luang, Bangkok
10250 Thailand.

Environmental Condition:
The measurement was carried out in an ambient temperature of (23±3)°C, and relative humidity of (50±10)%.

Measurement Method:
Und Under Calibration (UAC) was calibrated by comparison method with standard chilled mirror hygrometer model 1840-3 in the humidity generator chamber to determine the errors.

Traceability:
This instrument was calibrated using standard equipment whose accuracy is traceable through National Institute of Standards and Technology to the international system of units (SI) via MCO Calibration, Inc. Certificate number: 20920-601. Due date: Sep 25, 2024.

Measurement Date : Jun 20, 2023
Issue Date : Jun 25, 2023

Measurement Results:
This equipment was connected with indoor air quality probe and Displayed (SFI) on display Model: Y8AF50, Serial number: V1920215.
Calibration was performed in the range of (20/90) to (80/90).
The results of calibration are reported in table below.

Observed (RH%)	Standard (RH%)	UAC (RH%)	Error (RH%)	Uncertainty (RH%)
20	20.03	19.2	-0.8	0.50
50	50.24	49.5	-0.8	0.50
80	80.53	80.5	0.2	0.50

Performed by:
☒ Mr. Nawat Thachalad
☒ Miss Jitrayorn Lertsamphol
☒ Miss Pangsripran Phosorn



Approved Signature:
Mr. Pancha Booncharon
Calibration Department Manager

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ACC-100-T01-T05
CALIBRATION 0367
Pressure measurement laboratory
Calibration services department.



Accredited calibration laboratory
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ACC-100-T01-T05
CALIBRATION 0367
Pressure measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No. : CP-010-06

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS RECEIVED
CUSTOMER

Digital barometer
Bresler
Sensor: 130-W5-138P
Data logger: 110-W5-250L-D
Sensor: BP-A3098
Data logger: AS988
RYS_730650
New Item
A.S. Laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd,
Khwaeng San Luang, Khet San Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 18 Jun 2023
MEASUREMENT DATE : 20 Jun 2023
ISSUE DATE : 20 Jun 2023

CONDITION OF THIS RESULT OF CALIBRATION:

1. Reference Standard Instrument:

Instrument Model Serial No. Certificate No. Due Date

Absolute Pressure Transducer CP02500 41001260 MP-0205-22 02 Dec 2023

1. Calibration: effort for calibration sequence C

2. The UAC* was isolated to vertical orientation above reference Standard Instrument and center of UAC* was used as the reference level.

3. Calibration condition:

4. Condition:

Pressure transmitting medium: Air

Pressure (kPa, 1 bar): 1.01 kg/m²

Relative Humidity (%): (50±10) %

Temperature (°C): (23±3) °C

Altitude (m): (10±10) m

5. The certificate is valid only to the item (indicated on date and place of calibration)

Calibrated by:
☒ Mr. Nawat Thachalad
☒ Miss Pangsripran Phosorn



Approved Signature:
Mr. Pancha Booncharon
Calibration Department Manager

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Pressure measurement laboratory
Calibration services department.

CERTIFICATE OF CALIBRATION

Certificate No. : CP-010-06

Page 1 of 2 Pages

MEASUREMENT RESULTS: ☒ Without adjustment ☐ With adjustment

CALIBRATION IN THE RANGE OF : RH value to 100% RH

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

STD (mbar)	UAC* (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
905.38	905.3	0.7	0.85
970.10	970.1	0.4	0.63
995.05	995.4	0.4	0.57
1000.10	1000.1	0.1	0.40
1000.07	1000.0	0.7	0.36
1000.00	1000.0	0.0	0.52

Note: UAC* Und Under Calibration
* To convert the result in report unit to Pa should be multiply by 100



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Tel: +66 2432 6328 Email: calibration@sithiporn.com



Cert. No. : ACC24008
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-75
Serial No. : 3500276
ID No. : RYG_FS0496

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 : 19 JANUARY 2024
Calibration Date : 26 JANUARY 2024
Date of Issue : 29 JANUARY 2024

Calibrated by : Nuthakorn Pitsupisarn

Approved by :
(Thanakul Petchburi)

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Tel: +66 2432 6328 Email: calibration@sithiporn.com



Cert. No. : ACC24008
Job No. : VC87AC0658
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	MY53202742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 300266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 300267	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL_BP 3140266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4189	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-43KA1	34560485	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	V74486069	EF-0012-23	10-FEB-24

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).

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Cert. No. : ACC24008
Job No. : VC87AC0658
Pages : 3 of 3

Result of calibration 1.

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	93.98	-0.02	0.14	0.40

2. Frequency

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

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
0.83	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

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472126 / 158778 / B8180
ID No.: RYG_FS0301

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PIATTHANAKAN 40, PIATTHANAKAN ROAD,
KHWAENG PIATTHANAKAN, 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 : 19 DECEMBER 2023
Calibration Date : 12 JANUARY 2024
Date of Issue : 16 JANUARY 2024

Calibrated by : Nithakorn Pitsupatun

Approved by : *T. Petchur*
(Thanakol Petchurai)

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48071076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 260266	13-FEB-24
Digital Multimeter	33461A	MY53220976	EEL-BP 314206	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 314206	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1061-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

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).

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
18.8

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

Frequency Weighting	Measured value (dB)
A-weight	12.0
C-weight	18.4
Flat	24.2

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.8	0.9	± 1.5
1000	-0.2	-0.2	-0.2	± 1.0
8000	-2.5	-2.5	-2.5	±5.0

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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
Log	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	±0.3

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	-	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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Cert. No. : ACL24027
Job No. : VC67AC0044
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.3	-1.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

T. Petchu

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Tel: +66 2433 8338 Email: calibration@sithiporn.com



Cert. No. : ACL24027
Job No. : VC67AC0044
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

T. Petchu

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Tel: +66 2433 8338 Email: calibration@sithiporn.com



Cert. No. : ACL24228
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : EION
Model : NE-42 / Microphone UC-52 / Preamplifier NH-04
Serial No. : 00734223 / 169439 / 72460
ID No. : RYO_F30829

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 : 10 JULY 2024
Calibration Date : 11 JULY 2024
Date of Issue : 15 JULY 2024

REVIEW BY : *Thakorn P.*
APPROVED BY : *Thakorn P.*
NEXT CAL DATE : 11/7/25

Calibrated by : Nuthakon Piatpattin

Approved by : *T. Petchu*
(Thakorn Petchu)

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SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

409-40/1 Srinthorn Road, Bangbunru, Bangkok, 10100 Thailand
Tel: +66 2433 8338 Email: calibration@sithiporn.com



Cert. No. : ACL24228
Job No. : VC67AC0127
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	MY40017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY53202742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21-0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20-0267	15-FEB-25
Digital Multimeter	34461A	MY60034273	EEL-BP 22-0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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).

T. Petchu

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Tel: +66 2433 8338 Email: calibration@sithiporn.com



Cert. No. : ACL24228
Job No. : VC67AC0127
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	-	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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Cert. No. : ACL24228
Job No. : VC67AC0127
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.0 (93.04)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Weighting (dB)
A-weight	9.9
C-weight	16.7
Flat	22.4

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-1.7	-1.6	-1.6	±5.0

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Cert. No. : ACL24228
Job No. : VC67ACB127
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

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
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
Fast	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Imp	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	±0.3

T. Petchum.

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Cert. No. : ACL24228
Job No. : VC67ACB127
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	±1.3
136.0	136.1	0.1	±1.3
135.0	135.1	0.1	±1.3
134.0	134.1	0.1	±1.3
133.0	133.0	0.0	±1.3
132.0	132.0	0.0	±1.3
131.0	131.0	0.0	±1.3
129.0	129.1	0.1	±1.3
124.0	124.0	0.0	±1.3
119.0	119.1	0.1	±1.3
114.0	114.1	0.1	±1.3
109.0	109.1	0.1	±1.3
104.0	104.1	0.1	±1.3
99.0	99.1	0.1	±1.3
94.0	94.0	0.0	±1.3
89.0	89.0	0.0	±1.3
84.0	84.0	0.0	±1.3
79.0	79.0	0.0	±1.3
74.0	74.0	0.0	±1.3
69.0	69.0	0.0	±1.3
64.0	64.0	0.0	±1.3
59.0	59.0	0.0	±1.3
54.0	54.0	0.0	±1.3
49.0	49.0	0.0	±1.3
44.0	44.0	0.0	±1.3
39.0	39.0	0.0	±1.3
34.0	34.0	0.0	±1.3
30.0	30.0	0.0	±1.3
29.0	29.0	0.0	±1.3
28.0	28.1	0.1	±1.3
27.0	27.0	0.0	±1.3
26.0	26.1	0.1	±1.3
25.0	25.1	0.1	±1.3

T. Petchum.

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Cert. No. : ACL24228
Job No. : VC67ACB127
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.3	-1.1	±3.0

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

T. Petchum.

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Cert. No. : ACL24228
Job No. : VC67ACB127
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

T. Petchum.

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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Tel: +66 2433 8338 Email: calibration@sithiporn.com



Cert. No. : ACL24091
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233184 / 144837 / 23232
ID No.: RYG_P80025

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 : (30.0 ± 20) %

Received Date : 19 JANUARY 2024
Calibration Date : 25-26 JANUARY 2024
Date of Issue : 29 JANUARY 2024

Calibrated by : Nathachon Pitsupitum

Approved by : T. Petchum.
(Thanakul Petchumai)

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CALIBRATION LABORATORY

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Tel: +66 2433 8338 Email: calibration@sithiporn.com



Cert. No. : ACL24091
Job No. : VC67ACB088
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-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53202104	EEL-BP 300206	13-FEB-24
Digital Multimeter	33461A	MY53202076	EEL-BP 290206	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 310206	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34504495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate in 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).

T. Petchum.

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	-	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

7. Peth.

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	10.8
C-weight	17.3
Flat	23.0

3. Acoustical signal tests of frequency weightings

Free-field acoustic response at a level of 84 dB

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

7. Peth.

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
50	-0.1	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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
Lat	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	±0.3

7. Peth.

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.1	0.1	±1.1
27.0	27.0	0.0	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

7. Peth.

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.1	0.1	±1.1

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
Once	136.4	135.6	-0.8	±3.0

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

7. Peth.

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

7. Peth.

Cert. No. : ACC24037
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No. : 34178123
ID No. : RYG_F30215

Condition As Found : GOOD

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

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

Received Date : 09 AUGUST 2024
Calibration Date : 23 AUGUST 2024
Date of Issue : 26 AUGUST 2024

Calibrated by : Nathakorn Pitsupatun

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

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Cert. No. : ACC24037
Job No. : VC67ACB140
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-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 210267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 200267	15-FEB-25
Digital Multimeter	33461A	MY60024273	EEL_BP 220267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25
Audio Analyzer	AVR-3366A	V744B6669	EF-0009-24	09-FEB-25

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).

*T. Petchur*Cert. No. : ACC24037
Job No. : VC67ACB140
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	94.06	0.06	0.45	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.4	0.1	0.1	1.0

3. Total distortion

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

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

End of Calibration Certificate

*T. Petchur*Cert. No. : ACL24073
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 01122579 / 172172 / 74022
ID No. : RYG_F30018

Condition As Found : GOOD

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

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

Received Date : 11 JANUARY 2024
Calibration Date : 22-24 JANUARY 2024
Date of Issue : 24 JANUARY 2024

Calibrated by : Nathakorn Pitsupatun

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

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. : ACL24073
Job No. : VC67ACB054
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-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 300266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 290266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 310266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

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).

*T. Petchur*Cert. No. : ACL24073
Job No. : VC67ACB054
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	-	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	0.3	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

T. Petchur

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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Cert. No. : ACL34073
Job No. : VC87AC0654
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
16.6

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

Frequency Weighting	Measured value (dB)
A - weight	14.2
C - weight	19.2
Flat	25.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	±1.5
1000	0.1	0.1	0.1	±1.0
8000	3.3	3.4	3.4	±5.0

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Cert. No. : ACL34073
Job No. : VC87AC0654
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	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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
Imp	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	±0.3

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Cert. No. : ACL34073
Job No. : VC87AC0654
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.1	0.1	±1.1
84.0	84.1	0.1	±1.1
79.0	79.0	0.0	±1.1
74.0	74.1	0.1	±1.1
69.0	69.1	0.1	±1.1
64.0	64.0	0.0	±1.1
59.0	59.1	0.1	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
38.0	27.9	-0.1	±1.1
27.0	27.0	0.0	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

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Cert. No. : ACL34073
Job No. : VC87AC0654
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±3.0
One	136.4	136.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.3	-0.1	±2.0
Negative half cycle	135.4	135.3	-0.1	±2.0

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Cert. No. : ACL34073
Job No. : VC87AC0654
Pages : 8 of 8

11. Overload indication

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

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

End of Calibration Certificate

T. Petchum

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Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24339
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamp/Filter NF-24
Serial No. : 00597168 / 180411 / 88181
ID No. : RYO_F50438

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 18 OCTOBER 2024
Calibration Date : 30 OCTOBER 2024
Date of Issue : 31 OCTOBER 2024

REVIEW BY: *S/S*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 30 Oct 2025

Calibrated by : Nuthakon Pongpium

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

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

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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Tel: +66 2433 8338 Email: calibration@sithiporn.com



Cert. No. : AC124339
Job No. : VC67ACB168
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 Acoustic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 210267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 200267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 220267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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).

T. Petch.

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Cert. No. : AC124339
Job No. : VC67ACB168
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

T. Petch.

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Cert. No. : AC124339
Job No. : VC67ACB168
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)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Weighting (dB)
A-weight	11.6
C-weight	17.8
Flat	23.4

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.3	0.4	±1.5
1000	0.1	0.1	0.1	±1.0
8000	0.6	0.7	0.7	±5.0

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Cert. No. : AC124339
Job No. : VC67ACB168
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	-0.2	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

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	±0.3

T. Petch.

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Cert. No. : AC124339
Job No. : VC67ACB168
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
127.0	127.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.1	0.1	±1.1
28.0	28.0	0.0	±1.1
27.0	27.1	0.1	±1.1
26.0	26.0	0.0	±1.1
25.0	25.1	0.1	±1.1

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Cert. No. : AC124339
Job No. : VC67ACB168
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	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

9. Tone burst response

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

T. Petch.

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-453/1 Srinthorn Road, Bangchun, Bangkok 10700 Thailand
Tel: 02-2435-8800 Fax: 02-2435-8800 Email: calcenter@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL24339
Job No. : VC87AC0168
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	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

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

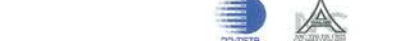
12. High level stability

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

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

End of Calibration Certificate

r. Petch



Request No. 21-670292 MTC No. EEL- BP. 830267

CALIBRATION CERTIFICATE

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Address : 104 Phatthanasak Rd., Khwaeng Phatthanasak, Khet Suan Luang, Bangkok, 10250.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
Soi 1C, Bangoo Industrial Estate, Sukhumvit Rd., Muang, Samprakan 10260.

Instrument Calibrated :
Description : Sound Calibrator
Manufacturer : Rion
Model : NC-74
Serial No. : 34178121 (ID-RYG_F50213)
Ambient Environment
Temperature : (23 ± 3) °C
Relative Humidity : (90 ± 15) %
Ambient Pressure : (101.325 ± 1.500) kPa

- Standards used :
1. Digital Function Synthesizer NF Electronic DP-195A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamaawa TPA-303A S/N 07 2214.
4. Digital Multimeter Agilent 34401A S/N MY4005560.
5. Pressure Transmitter Vaisala PTB302AD S/N T060001.
6. Audio Analyzer Keithley 2015-P S/N4106495.
7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an invert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 19 Feb. 2024

Date of Calibration : 28 Feb. 2024

1/2

The results relate only to the items presented/submitted or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TSTR.

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Office : 104 Phatthanasak Road, Latphao, Chatuchak, Bangkok 10900, Thailand
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SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (Q13) 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 test results of each item were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511H	MY53202742	EF-0010-23	07-FEB-24
Digital Multimeter	34461A	MY53220104	EEL-BP 304056	13-FEB-24
Digital Multimeter	34461A	MY53220076	EEL-BP 314056	13-FEB-24
Digital Multimeter	34461A	MY53220123	EEL-BP 314056	13-FEB-24
Programmable Attenuator	MAT-1070	62106114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2957900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34560495	AA-3002-23	14-FEB-24

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).

Cert. No. : ACL23323
Job No. : VC87AC0011
Pages : 2 of 8



Request No. 21-670292 MTC No. EEL- BP. 830267

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
Nominal Output of Unit Under Test = 94 dB re 20μPa at 1000 Hz
Acoustic Output in dB re 20μPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942-2003 Class 1
1/2 inch Bruel&Kjaer 4180	94.01	0.01	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942-2003 Class 1
1/2 inch Bruel&Kjaer 4180	1003.1	3.1	± 1.5	±1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942-2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.80	± 0.50	±1.0%

Note : 1. No adjustment.

2. The calibration pressure correction was not included.

3. The microphone volume correction was included at level of 0.16 dB from nominal.

Calibrated by : *Mr. Wernuch Deechaiyan*
Approved by : *Mr. Parnas Klayong*
Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre
Ref: 2011207021900719001

Date of Calibration : 28 Feb. 2024
Date of Issue : 29 Feb. 2024
End of Certificate 2/2

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Head Office : 25 Mu 3 Tambon Khlong Nue, Amphoe Khlong Luang, Changwat Pathumthani 12125, Thailand
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SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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Cert. No. : ACL23323
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Pre-amplifier N01-24
Serial No. : 00873057 / 171591 / 73333
ID No. : RYG_F50381

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN RD., 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 : 11 OCTOBER 2023
Calibration Date : 19-20 OCTOBER 2023
Date of Issue : 24 OCTOBER 2023

Calibrated by : Nuthakorn Pongpauwan

Approved by : *T. Petch*
(Thanakul Petchural)

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 CO., LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Summary of Measurement Result :

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

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.9

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

Frequency Weighting	Measured value (dB)
A - weight	12.0
C - weight	18.2
Flat	24.0

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.3	0.6	0.6	±5.0

QP-TS12-04-04-020664

T. Petchu

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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
Imp	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	±0.3

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T. Petchu

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.8	-0.2	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.8	-0.2	±1.1

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T. Petchu

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
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8. Level linearity including the level range control

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

9. Time burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±5.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±3.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±3.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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T. Petchu

Continuation of Calibration Certificate

Cert. No. : ACL23323
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11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QP-TS12-04-04-020664

T. Petchu



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Cert. No. : ACL23324
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 00873109 / 171842 / 73485
ID No. : RYG_F90384

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 46, PHATHANAKAN ROAD,
KHUWAENG PHATHANAKAN, 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 : 11 OCTOBER 2023
Calibration Date : 19-20 OCTOBER 2023
Date of Issue : 24 OCTOBER 2023

Calibrated by : Natchorn Pongpisan

Approved by : T. Petchu
(Thumkul Petchurui)

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other than in full, except with the prior written approval of the head of Calibration Laboratory.

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL23324
Job No. : VC87AC0011
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 300266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 290266	13-FEB-24
Digital Multimeter	34461A	MY90034273	EEL_BP 310266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

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

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

3.1 National Institute of Metrology (Thailand).

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

QF-TS12-04-04-020664

T. Rith.

Continuation of Calibration Certificate

Cert. No. : ACL23324
Job No. : VC87AC0011
Pages : 3 of 8

Summary of Measurement Result :

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

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QF-TS12-04-04-020664

T. Rith.

Continuation of Calibration Certificate

Cert. No. : ACL23324
Job No. : VC87AC0011
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
16.8

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

Frequency Weighting	Measured value (dB)
A-weight	11.3
C-weight	17.5
Flat	23.1

3. Acoustical signal tests of frequency weightings

Measure 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	0.5	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-1.2	-1.1	-1.1	±5.0

QF-TS12-04-04-020664

T. Rith.

Continuation of Calibration Certificate

Cert. No. : ACL23324
Job No. : VC87AC0011
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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	±0.3

QF-TS12-04-04-020664

T. Rith.

Continuation of Calibration Certificate

Cert. No. : ACL23324
Job No. : VC87AC0011
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	43.9	-0.1	±1.1
39.0	38.9	-0.1	±1.1
34.0	34.0	0.0	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.8	-0.2	±1.1
25.0	24.9	-0.1	±1.1

QF-TS12-04-04-020664

T. Rith.

Continuation of Calibration Certificate

Cert. No. : ACL23324
Job No. : VC87AC0011
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

T. Rith.

Continuation of Calibration Certificate

Cert. No.: ACL23324
Job No.: VC67AC0811
Page: 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QC-TS12-04-04-02664

T. B. B.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
2349 PATTANAKARN ROAD VIA 16, BANGKOK, THAILAND 10250
TEL: 02-2515000 FAX: 02-2515048



Certificate of Calibration

Certificate No.: 23E024
Page: 1 of 2

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenExcellence
Serial No.: B634291445
ID No.: RVO_336152
Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 14 December 2023
Reference: 2312-0151DSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (10 ± 10) %
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phrakdaeng, Rayong 21140, Thailand

Procedure used: Calibration was conducted using calibration procedure No. CP-E17 according to EURAMET eg 15.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibration	5024	243502	EE-0041-23	26 Apr 2024
2) The result of calibration was made on request at the point specified by customer.				
3) The certificate is valid only for the item calibrated on date and place of calibration.				
4) The Calibration is traceable to the International System of Unit maintained through:				
National Institute of Metrology (NIMT)				

REVIEW BY: *H. B. B.*
APPROVED BY: *D. B. B.*
EFFECTIVE DATE: 14/06/25 (x6/25)

Calibrated by: Neechthorn Prasansuwan
Issue Date: 15 December 2023

Approved Signatory:

() Phatima Prasansuwan
() Neechthorn Prasansuwan
() Phatima Prasansuwan

0331106



Cert. No.: 23E024
Page: 2 of 2

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

Function: DC voltage measurement	Range: 2000 mV	Standard Value (mV)	UUC Reading (mV)	Error (mV)	Uncertainty (± mV)
		-200.0000	-199.9	0.1	0.6
		-150.0000	-150.0	0.0	0.5
		-100.0000	-100.0	0.0	0.3
		-50.0000	-50.0	0.0	0.1
		0.0000	0.0	0.0	0.6
		50.0000	50.0	0.0	0.1
		100.0000	100.0	0.0	0.3
		150.0000	150.0	0.0	0.5
		200.0000	199.9	-0.1	0.6

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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1193422



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
2349 PATTANAKARN ROAD VIA 16, BANGKOK, THAILAND 10250
TEL: 02-2515000 FAX: 02-2515048



Certificate of Calibration

Cert. No.: 23CH1574
Page: 1 of 3

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenExcellence
Serial No.: B634291445
ID No.: RVO_336152
Condition As-Received: Used Item
Received Date: 08 December 2023
Calibration Date: 15 December 2023
Reference: 2312-0151DSC-3
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phrakdaeng, Rayong 21140, Thailand

Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure:
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH6 by comparison with standard thermometer

Calibrated by: Warakorn Lemgajakul

Approved by: *W. L.*
Approved Signatory

() Sathip Meangmai
() Warakorn Lemgajakul
() Porpan Pajon

Issue Date: 19 December 2023

The Uncertainty are for a confidence probability of approximately 95 %

This certificate was issued upon request and is valid only for the item calibrated on date and place of calibration.
Approved by: Head of Calibration and Testing Services

A 0061696



Cert. No.: 23CH1574
Page: 2 of 3

Condition of this calibration result

Reference Standard Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	5403049	13GR116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23098	28 July 2024
This certification is traceable to the International System of Unit maintained through: - Technology Promotion Association (Thailand-Japan)				

2. Certified Reference Materials: The measurement results are traceable to SI through CPA then Lit.
ANSI-ASQ National Accreditation Board, Accredited No. AN-1838

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	913594	14 July 2025
pH 6.860	CPA chem	831959	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function: mV Measurement

Performing standard curve by Fluke at pH (4.7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement (mV)	Coverage factor
		pH	mV	pH	
pH Meter	4.000	177.48	177.3	0.058	2.00
SN: B634291445	7.000	0.00	-0.1	7.000	0.058
	10.000	-177.48	-177.5	10.000	0.058

W. L.

1193852



Cert. No.: 23CH1574
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 (±)	Coverage factor
pH Electrode	4.008	4.013	184.1	0.0045	2.00
SN: 3225368	6.860	6.995	8.7	0.0084	2.00
	9.997	10.002	-184.7	0.0088	2.11

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe.

Model: InLabExpert Pro-ISM

Serial No.: 3225368

Denomination of probe:

- Length: 120 mm

- Diameter: 12 mm

- Immersion Depth: 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor
25.0	25.003	24.3	-0.703	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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1193851



Cert.No.: 23TW108
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Received Date : 21 July 2023
Test Date : 24 July 2023
Reference : 2307-071305C-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phukdaeng,
Rayong 21140, Thailand
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Acid Modification Method
Tested by : Waleak Sittituan
Approved by : Sattitip
Approved Signatory
() Akkara Buthana
(x) Sattitip Meangmai
() Watsorn Lermagratkul
Issue Date : 26 July 2023

REVIEW BY: N. Bangert
APPROVED BY: D. Bangert
NEXT CAL DATE: 24/01/25

1159515



Cert.No.: 23TW108
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	1126143764	140RC004	22MM50	20 Sep 2023

Material	Manufacturer	Lot No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 15E100454

Titration Method (Acid Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.17	0.0055

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

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1172155



Cert. No.: 23LM125
Page: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5, T. Maenam Khu, A. Phukdaeng,
Rayong 21140 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 25 July 2023
Calibrated Date : 27 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Preecha Itahab
Approved by : Preecha Itahab
Approved Signatory
() Pongthipha Tameyikul
() Meise Buthana
(x) Suwit Injai
Issue Date : 31 July 2023

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 & Equipment Calibration and Testing Services.

0053616



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2307-071305C-2
Procedure Used :-

Cert. No.: 23LM125
Page: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with
Industrial Platinum Resistance Thermometer (SPRT) 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 2188050 2211285 TPA 21 Oct 2023
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (°) Without Adjustment
Function : Temperature measurement.

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor
20.00	100	20.011	19.91	-0.101	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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1159515



Certificate of Calibration

Cert. No.: 24TM163
Page: 1 of 3

Equipment : Low Temp. Incubator
Manufacturer : Memmert
Model : PP750
Serial No. : V618.0064
ID No. : RYG_EN0154

REVIEW BY: Thaichak
APPROVED BY: D. Bangert
NEXT CAL DATE: 01/05/26

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

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 : Kunchit Meise

Approved by : Kunchit
Approved Signatory

() Pongpan Pajom
() Suwit Injai
(x) Kunchit Promrat

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 & Equipment Calibration and Testing Services.



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

Cert. No.: 24TM163
Page: 2 of 3

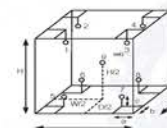
Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct
measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:
Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition M144073381 24LM73 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
Fresh air setting : Close



Probe Installation Details :
a = 10 cm
b = 10 cm
c = 10 cm
Dimension of Chamber :
D = 0.80 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-21
2	1RTD-22
3	22-01RTD-03
4	1RTD-24
5	1RTD-25
6	1RTD-26
7	23-01RTD-07
8	1RTD-28
9 (ref.)	23-01RTD-09



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2411-00020C-1
Result of Calibration : (+/-) Without Adjustment
Function of UUC : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM1563
Page: 3 of 3

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

Calibration Point (°C)	1	2	3	4	5	6	7	8	9 (ref.)	Uncertainty (± °C)
20.0	20.071	19.915	20.272	20.179	19.977	19.762	20.096	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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PITTAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10550
TEL 0-2717-3000-29 FAX 0-2718-9484



Certificate of Calibration

Cert.No.: 24CG3711
Page: 1 of 2

Equipment : Burette
Capacity : 50 mL
Serial No. :
ID. No. : RYG_EN0216
Manufacturer : Wlog
Made in : Germany
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Raying Branch
616/10 Moo 5, T.Maenam Khu, A.Pluakdaeng
Raying 21140, Thailand
Ambient Temperature : (20 ± 2.5) °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 756 mmHg
Calibration Procedure : ASTM E 542 - 01
Calibrated by : Sa-nguankun Wongsa

Approved by :
(✓) Srisuda Khamtha
() Porpan Papien
() Unnopphol Harachai

Issue Date : 24 September 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 & Equipment Calibration and Testing Services.



Equipment : Burette
Received Date : 19 September 2024
Condition As-Received : Used Item
Calibration Date : 24 September 2024
Reference : 2409-0756DSC-3

Cert.No.: 24CG3711
Page: 2 of 2

Condition of this result of calibration

- Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205	B134206712	140RC007	24MM316	TPA	15 July 2025
2) Data Logger	HL-20D	20663159	140EC012	23H2174	TPA	10 Oct 2024
3) Thermometer	-	1594592	140EC010	241175	TPA	20 Feb 2025
- This certification is traceable to SI Unit.
- The certificate is valid only to the item calibrated on date and place of calibration.
- True value is converted to true volume at the standard temperature of 20 °C.

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
10	10.0259	0.0052	2.00
20	20.0214	0.0085	2.00
30	30.0066	0.0089	2.00
40	40.0003	0.0094	2.00
50	49.9968	0.011	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 %.

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Certificate of Calibration

Equipment : SPECTROPHOTOMETER
Model : DR8000
Serial No. (or ID.): 1627645 (RYG_EN0037)
Manufacturer : HACH
Condition : In Condition

Certificate No.: C06230441
Issued Date: 19 September 2023
Job No.: WO-0005382
Page: 1 of 3

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

Environment Condition : Temperature 23.9 °C ± 0.2
Humidity 65.3 %RH ± 1.5

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

Calibration By : Mr Nattapat Rungsuang
Calibration Date : 18 September 2023
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 Sigma Scientific Limited.
The standard for Wavelength Certificate No. 111583 and 111584
The standard for Photometric Certificate No. 911464 and 111588
The standard for Stray Light Certificate No. 111586 and 111585
The standard for Spectral resolution Certificate No. 111587

REVIEW BY :
APPROVED BY :
NEXT CAL DATE : 18/9/25

(Mr. Nattapat Rungsuang)
Person in charge

(Mr. Nitun Sawan)
Authorized signatory

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

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

Delivering Growth - In Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06230441 Page 2 of 3

Calibration Results: Without Adjustment

Wavelength Accuracy (nm): The spectral bandwidth of 682 at 2 nm and UUC at 2 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
415.61	415.3	0.31	0.13	
536.66	536.6	0.06	0.13	
637.88	638.3	-0.32	0.13	
748.48	748.7	-0.22	0.13	
807.53	807.4	-0.37	0.13	

Photometric Accuracy (Absorbance)	Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
0.0000	420 nm	0.2930	0.289	0.0040	0.0045
0.0000	440 nm	0.2867	0.283	0.0037	0.0045
0.0000	465 nm	0.4365	0.482	-0.0025	0.0045
0.0000	540 nm	0.9334	0.923	0.0004	0.0045
0.0000	590 nm	0.2594	0.259	0.0004	0.0045
0.0000	635 nm	0.5040	0.506	-0.0010	0.0045
0.0000		1.0032	1.002	0.0012	0.0045
0.0000		0.2578	0.257	0.0009	0.0045
0.0000		0.4971	0.497	0.0001	0.0045
0.0000		0.9720	0.971	0.0010	0.0045

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

Delivering Growth - In Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06230441 Page 3 of 3

Calibration Results: Without Adjustment

Photometric Accuracy (Absorbance)	Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
0.0000	235 nm	0.7355	0.737	-0.0015	0.0080
0.0000	257 nm	0.8874	0.887	0.0004	0.0080
0.0000	313 nm	0.2964	0.290	-0.0036	0.0080
0.0000	350 nm	0.6374	0.637	0.0004	0.0080

Stray light *	Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%)	Absorbance (A)
	260.82 ±0.11 nm	260.6	1.3	1.886
	391.44 ±0.11 nm	391.4	1.3	1.886

Spectral Resolution *	Peak	Trough	Ratio	BBW
Nominal Concentration 0.02 % v/v				
Standard Wavelength (nm)	268.66	266.69	1.38	2.00
UUC: Wavelength (nm)	268.2	266.1		
Std Absorbance (A)	0.4568	0.2780		
Absorbance (A)	0.413	0.300		

* Calibration Marked * Not TSI Accredited * In this Certificate has been included for completeness.

The End of Certificate

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

Delivering Growth - In Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022



Certificate of Calibration

Cert. No.: 24TM34
Page : 1 of 3

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 110
Serial No. : B423.0853
ID No. : RYG-EN0213
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khn,
A. Phrakdaeng,
Rayong 21140 Thailand
Location : Oven Room
Received Order : 21 March 2024
Calibration Date : 21 - 22 March 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongsaboon
Approved by :
() Pornthippa Tarneyakul
() Ummaphol Harachai
✓ Suwit Injai

Issue Date : 23 March 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 & Equipment Calibration and Testing Services.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2403-0563OC-3
Procedure Used :-

Cert. No.: 24TM34
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement
method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and
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 MY57013711 23LM115 TPA 11 Jul 2024

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

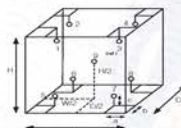
3. This certificate is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.40 m
b = 5.0 cm W = 0.56 m
c = 5.0 cm H = 0.48 m
Capacity = 0.11 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	27
REL Humid. (%)	59	59
AC Supply (Vol)	224	223

Ref. Std. ID No. : 24		
Calibration Point		
Position	(180) °C	(104) °C
1	16-18TC-01	16-18RTD-01
2	16-18TC-02	16-18RTD-02
3	16-18TC-03	16-18RTD-03
4	16-18TC-04	16-18RTD-04
5	16-18TC-05	16-18RTD-05
6	16-18TC-06	23-18RTD-06
7	16-18TC-07	16-18RTD-07
8	16-18TC-08	22-18RTD-08
9 (ref.)	16-18TC-09	16-18RTD-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2403-0563OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM34
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
104.0	104.0	104.0	0.065	0.52	0.90	2
180.0	180.0	180.0	0.20	1.2	2.0	2

Calibration Point (°C)		Measured Temperature (°C)									Uncertainty (± °C)
		1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.0	104.189	103.508	103.898	103.772	103.772	102.730	104.289	103.805	103.798	0.42
180.0	180.0	180.701	179.239	179.935	179.999	180.127	180.136	180.895	179.313	180.211	1.1

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.: 24TM35
Page : 1 of 3

Equipment : Water Bath
Manufacturer : Memmert
Model : WM622
Serial No. : L513.0648
ID No. : RYG-EN0001
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5, T. Maenam Khn,
A. Phrakdaeng,
Rayong 21140, Thailand
Location : Wet Chemistry Lab
Received Order : 21 March 2024
Calibration Date : 21 March 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongsaboon
Approved by :
() Pornthippa Tarneyakul
() Ummaphol Harachai
✓ Suwit Injai

Issue Date : 23 March 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 & Equipment Calibration and Testing Services.



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2403-0563OC-4
Procedure Used :-

Cert. No.: 24TM35
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 (PRT).

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 MY57013711 23LM115 TPA 11 Jul 2024

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.

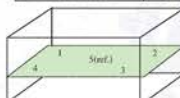
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

		Environmental		AC Voltage Supply	
		(°C)	(%R.H.)	(Volt)	(Volt)
Beginning of Calibration		25	55	222	
Finished of Calibration		25	57	223	



Position		Ref. Std. ID No.:
1		4803988-001
2		4803988-002
3		4803988-003
4		4803988-004
5(ref.)		4803988-005



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2403-0563OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM35
Page : 3 of 3

Calibration point (°C)		UUC* Setting (°C)		UUC* Reading (°C)		Average* Standard Reading (°C)					Uncertainty (± °C)
						1	2	3	4	5 (ref.)	
85.0	85.0	85.0	85.0	84.426	84.424	84.469	84.507	84.477	84.477	84.477	0.18

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Coverage Factor
85.0	85.0	85.0	0.11	2	2

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

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

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

UUC* : Unit Under Calibration

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

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

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Calibration Results:
Pre Calibration

Certificate No.: C29240511

Page: 3 of 4

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A1	360	360	360	401.5	21.5	1.5
A2				401.2	21.2	1.5
A3				399.1	19.1	1.5
A4				397.6	17.6	1.5
A5				395.1	15.1	1.5
B1				398.6	18.6	1.5
B2				396.1	16.1	1.5
B3				392.9	12.9	1.5
B4				391.6	11.6	1.5
B5				390.7	10.7	1.5
C1				395.9	15.9	1.5
C2				395.6	15.6	1.5
C3				392.6	12.6	1.5
C4				391.7	11.7	1.5
C5				390.3	10.3	1.5
D1				397.6	17.6	1.5
D2				386.6	16.6	1.5
D3				385.0	15.0	1.5
D4				384.2	14.2	1.5
D5				383.8	13.8	1.5

Calibration Results:
Without adjustment

Certificate No.: C29240511

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Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A1	360	365	365	382.5	17.5	1.5
A2				382.4	17.4	1.5
A3				382.1	17.1	1.5
A4				379.7	14.7	1.5
A5				378.9	13.9	1.5
B1				395.1	15.1	1.5
B2				390.1	10.1	1.5
B3				378.5	13.5	1.5
B4				375.3	10.3	1.5
B5				375.1	10.1	1.5
C1				380.1	10.1	1.5
C2				380.1	15.1	1.5
C3				378.9	13.9	1.5
C4				376.2	10.2	1.5
C5				377.5	12.5	1.5
D1				380.5	10.5	1.5
D2				380.9	10.9	1.5
D3				378.1	13.1	1.5
D4				376.7	10.7	1.5
D5				377.7	12.7	1.5

The End of Certificate

ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

ชนิดเครื่อง: Block Digestion Unit
หมายเลข: 57202100065770200073

เลขใบกำกับ: WO-00020429

ตรวจสอบ (ปี)		รายการตรวจเช็ค	ตรวจสอบ (ปี)		หมายเหตุ
11 Mar 2024			11 Mar 2024		
ผ่าน	ไม่ผ่าน		ผ่าน	ไม่ผ่าน	
General					
01	01	1. สภาพทั่วไป	01	01	
02	02	2. การทำงาน Main Switch	02	02	
03	03	3. การทำงาน Selector Key	03	03	
04	04	4. การแสดงผล Display	04	04	
05	05	5. สภาพ Hole	05	05	
06	06	6. สภาพฝาปิด	06	06	ไม่
07	07	7. สภาพเซ็นเซอร์	07	07	
08	08	8. การตรวจสอบ ณ สถานที่แก้ไข	08	08	

ชื่อคนส่ง: _____

M. Thanathorn Phueok
Service Engineer