

ภาคผนวก ค

ใบรับรองผลการตรวจวัดคุณภาพสิ่งแวดล้อม

ภาคผนวก ค-1

คุณภาพอากาศในบรรยากาศ



Analysis / Test Report



TESTING
No.0042

Lot ID: 2499740
Date Received : Sep 16, 2024
Date Reported : Sep 20, 2024
Report Number: 3095337-1

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O :
Project Name :
Project Location :

Page 1 of 1

Sample Description	Air Quality	Sampled Date	Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
Location	11/11/11/11/11 (A1) (GPS 47° 0753569, 1427894)					
Date Analysis Commenced	Sep 17, 2024					
Condition of Sample	Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag					
Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)	
2499740-1	Sep 07 - Sep 08, 2024	0.029	0.019	753	30	
2499740-2	Sep 08 - Sep 09, 2024	0.031	0.022	753	29	
2499740-3	Sep 09 - Sep 10, 2024	0.031	0.025	753	30	
2499740-4	Sep 10 - Sep 11, 2024	0.039	0.026	753	29	
2499740-5	Sep 11 - Sep 12, 2024	0.020	0.018	753	29	
2499740-6	Sep 12 - Sep 13, 2024	0.019	0.017	753	28	
2499740-7	Sep 13 - Sep 14, 2024	0.025	0.018	753	28	
Guideline		0.33	0.12	-	-	

Reference Method
Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B
Particulate Matter (PM-10) : US EPA 40 CFR Part 50 Appendix J

Guideline : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004
Sampled By : Panuwat Wanglong

Remark :
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Result apply to the sample(s) as submitted, unless the sampling was conducted by ALS Laboratory Group (Thailand) Co., Ltd. An ALS Limited Company. This report is not reproduced except in full.

Approved by

Thanita Kulunwong

Scientist (4)

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2721-02 / BNAI

S:\Reports_Air Ambient\Days\pr (3-45PM)



Analysis / Test Report



TESTING
No.0042

Lot ID: 2499740
Date Received : Sep 16, 2024
Date Reported : Sep 20, 2024
Report Number: 3095337-2

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O :
Project Name :
Project Location :

Page 1 of 1

Sample Description	Air Quality	Sampled Date	Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
Location	๓๖๖๖๖๖๖ (A2) (GPS 47P 0751179, 142554๘)					
Date Analysis Commenced	Sep 17, 2024					
Condition of Sample	Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag					
Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)	
2499740-8	Sep 07 - Sep 08, 2024	0.030	0.021	753	30	
2499740-9	Sep 08 - Sep 09, 2024	0.032	0.021	753	29	
2499740-10	Sep 09 - Sep 10, 2024	0.039	0.026	753	30	
2499740-11	Sep 10 - Sep 11, 2024	0.046	0.028	753	29	
2499740-12	Sep 11 - Sep 12, 2024	0.035	0.022	753	29	
2499740-13	Sep 12 - Sep 13, 2024	0.031	0.020	753	28	
2499740-14	Sep 13 - Sep 14, 2024	0.037	0.019	753	28	
Guideline		0.33	0.12	-	-	

Reference Method
Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B
Particulate Matter (PM-10) : US EPA 40 CFR Part 50 Appendix J

Guideline : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004
Sampled By : Panuwat Wanglong

Remark :
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2721-02 / BNAI

S:\Reports_Air Ambient\Days\pr (3-45PM)



Analysis / Test Report

Client : Rojana Industrial Park Public Co., Ltd.
3/7 Moo 2, Rojana Industrial Park (Rayong), Banbung-Bankhai Rd., Nongbua,
Bankhai, Rayong Thailand 21120
P/O : RJA-077/66
Project Name : Rayong Bankhai
Project Location :
Lot ID: 2498843
Date Received : Sep 16, 2024
Date Reported : Sep 20, 2024
Report Number: 3093567-2

Page 1 of 1

Sample Description		Air Quality	
Location	Parameter	Unit	Value
Date Analysis Commenced		Sep 17, 2024	
Condition of Sample		Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag	
Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Atmospheric Temperature (°C)
2498843-8	Sep 07 - Sep 08, 2024	0.172	30
2498843-9	Sep 08 - Sep 09, 2024	0.106	29
2498843-10	Sep 09 - Sep 10, 2024	0.108	30
2498843-11	Sep 10 - Sep 11, 2024	0.062	29
2498843-12	Sep 11 - Sep 12, 2024	0.036	29
2498843-13	Sep 12 - Sep 13, 2024	0.025	28
2498843-14	Sep 13 - Sep 14, 2024	0.026	28
Guideline		0.33	0.12

Reference Method
Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B
Particulate Matter (PM-10) : US EPA 40 CFR Part 50 Appendix J
Guideline : Notification of the National Environmental Board, No.24, 2004 (B.E.2547) dated September 22, 2004
Sampled By : Panuwat Wangbong
Remark :
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Approved by

Thanita Kulnirwong
Scientist (4)

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O :
Project Name :
Project Location :
Lot ID: 2499734
Date Received : Sep 16, 2024
Date Reported : Sep 20, 2024
Report Number: 3095293-1

Page 1 of 1

Sample Description		Air Quality	
Location	Parameter	Unit	Value
Date Analysis Commenced		Sep 07, 2024 - Sep 14, 2024	
Measurement by		Panuwat Wangbong	
Time	2499734-1	2499734-2	2499734-3
10:00 AM - 11:00 AM	0.0049	0.0082	0.0069
11:00 AM - 12:00 PM	0.0056	0.0080	0.0076
12:00 PM - 01:00 PM	0.0061	0.0091	0.0067
01:00 PM - 02:00 PM	0.0066	0.0075	0.0081
02:00 PM - 03:00 PM	0.0076	0.0073	0.0079
03:00 PM - 04:00 PM	0.0088	0.0089	0.0078
04:00 PM - 05:00 PM	0.0079	0.0092	0.0065
05:00 PM - 06:00 PM	0.0071	0.0088	0.0068
06:00 PM - 07:00 PM	0.0076	0.0085	0.0089
07:00 PM - 08:00 PM	0.0081	0.0081	0.0060
08:00 PM - 09:00 PM	0.0073	0.0061	0.0094
09:00 PM - 10:00 PM	0.0060	0.0052	0.0076
10:00 PM - 11:00 PM	0.0055	0.0058	0.0063
11:00 PM - 12:00 AM	0.0053	0.0066	0.0052
12:00 AM - 01:00 AM	0.0052	0.0071	0.0041
01:00 AM - 02:00 AM	0.0056	0.0061	0.0035
02:00 AM - 03:00 AM	0.0054	0.0053	0.0036
03:00 AM - 04:00 AM	0.0057	0.0048	0.0034
04:00 AM - 05:00 AM	0.0057	0.0048	0.0032
05:00 AM - 06:00 AM	0.0055	0.0047	0.0034
06:00 AM - 07:00 AM	0.0058	0.0044	0.0035
07:00 AM - 08:00 AM	0.0062	0.0045	0.0034
08:00 AM - 09:00 AM	0.0082	0.0046	0.0048
09:00 AM - 10:00 AM	0.0076	0.0058	0.0076
Average	0.0065	0.0066	0.0059
1hr - Maximum	0.0088	0.0092	0.0094
Standard 1hr - Average	0.170	0.170	0.170
Standard	: Notification of the National Environment Board No. 33, 2009 (B.E. 2552).		
Reference Method	: US EPA Method Part 50 App. F (Chemiluminescence)		

Approved by

Orawan R.

Orawan R.
Scientist (3)

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S:\Report\Air SO\MOI.rpt (6:12PM)



Analysis / Test Report

Client: Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120

P/O :

Project Name :

Project Location :

Lot ID: 2499734

Date Received : Sep 16, 2024

Date Reported : Sep 20, 2024

Report Number: 3117587-1

Page 1 of 1

Sample Description Location	Air Quality %RH/Vis (A2) (GPS 47P 0751179, 1425549) Nitrogen dioxide (ppm)	2499734-8		2499734-9		2499734-10		2499734-11		2499734-12		2499734-13		2499734-14	
		Time	Measurement Date	Time	Measurement Date	Time	Measurement Date	Time	Measurement Date	Time	Measurement Date	Time	Measurement Date	Time	Measurement Date
12:00 PM - 01:00 PM		0.0052	Sep 07, 2024	0.0051	Sep 08, 2024	0.0042	Sep 09, 2024	0.0058	Sep 10, 2024	0.0064	Sep 11, 2024	0.0048	Sep 12, 2024	0.0064	Sep 13, 2024
01:00 PM - 02:00 PM		0.0041		0.0053		0.0044		0.0065		0.0065		0.0057		0.0059	
02:00 PM - 03:00 PM		0.0047		0.0049		0.0053		0.0064		0.0048		0.0055		0.0075	
03:00 PM - 04:00 PM		0.0053		0.0052		0.0050		0.0072		0.0050		0.0053		0.0097	
04:00 PM - 05:00 PM		0.0060		0.0056		0.0050		0.0047		0.0047		0.0053		0.0097	
05:00 PM - 06:00 PM		0.0060		0.0066		0.0052		0.0078		0.0047		0.0057		0.0079	
06:00 PM - 07:00 PM		0.0061		0.0063		0.0071		0.0092		0.0048		0.0067		0.0066	
07:00 PM - 08:00 PM		0.0063		0.0048		0.0081		0.0088		0.0047		0.0058		0.0065	
08:00 PM - 09:00 PM		0.0063		0.0046		0.0075		0.0091		0.0048		0.0052		0.0053	
09:00 PM - 10:00 PM		0.0058		0.0043		0.0070		0.0089		0.0046		0.0049		0.0040	
10:00 PM - 11:00 PM		0.0053		0.0044		0.0064		0.0084		0.0047		0.0049		0.0049	
11:00 PM - 12:00 AM		0.0051		0.0046		0.0057		0.0076		0.0048		0.0052		0.0051	
12:00 AM - 01:00 AM		0.0052		0.0046		0.0054		0.0079		0.0056		0.0052		0.0056	
01:00 AM - 02:00 AM		0.0053		0.0045		0.0052		0.0066		0.0047		0.0051		0.0059	
02:00 AM - 03:00 AM		0.0054		0.0045		0.0049		0.0065		0.0047		0.0055		0.0056	
03:00 AM - 04:00 AM		0.0052		0.0044		0.0054		0.0060		0.0054		0.0048		0.0057	
04:00 AM - 05:00 AM		0.0050		0.0042		0.0049		0.0060		0.0060		0.0051		0.0048	
05:00 AM - 06:00 AM		0.0048		0.0043		0.0048		0.0057		0.0069		0.0054		0.0054	
06:00 AM - 07:00 AM		0.0048		0.0044		0.0050		0.0056		0.0050		0.0053		0.0025	
07:00 AM - 08:00 AM		0.0050		0.0042		0.0051		0.0055		0.0046		0.0051		0.0036	
08:00 AM - 09:00 AM		0.0048		0.0042		0.0052		0.0080		0.0044		0.0051		0.0045	
09:00 AM - 10:00 AM		0.0046		0.0046		0.0051		0.0073		0.0047		0.0047		0.0032	
10:00 AM - 11:00 AM		0.0047		0.0045		0.0053		0.0056		0.0056		0.0050		0.0040	
11:00 AM - 12:00 PM		0.0051		0.0042		0.0054		0.0057		0.0047		0.0065		0.0041	
Average		0.0053		0.0047		0.0055		0.0071		0.0051		0.0053		0.0056	
1hr - Maximum		0.0063		0.0066		0.0066		0.0092		0.0069		0.0067		0.0097	
Standard 1hr - Average		0.170		0.170		0.170		0.170		0.170		0.170		0.170	

Standard : Notification of the National Environment Board No. 33, 2009 (B.E. 2552).

Reference Method : US EPA Method Part 50 App. F (Chemiluminescence)

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. ALS is not responsible for the accuracy of the results if the sample was not properly handled or if the results are not representative of the sample.

Orawan R.

Orawan Rakying
Scientist (3)

Approved by

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S:\Report_Lat SO\MOI.rpt (6:12PM)



Analysis / Test Report

Client: Rojana Industrial Park Public Co., Ltd.

3/7 Moo 2, Rojana Industrial Park (Rayong), Banbung-Bankhai Rd., Nongbua, Bankhai,

Rayong Thailand 21120

P/O : RJN-077/66

Project Name : Rayong Bankhai

Project Location :

Lot ID: 2498839

Date Received : Sep 16, 2024

Date Reported : Sep 20, 2024

Report Number: 3117500-1

Page 1 of 1

Sample Description Location	Air Quality %RH/Vis (A2) (GPS 47P 0755473, 1424134) Nitrogen dioxide (ppm)	2498839-8		2498839-9		2498839-10		2498839-11		2498839-12		2498839-13		2498839-14	
		Time	Measurement Date	Time	Measurement Date	Time	Measurement Date	Time	Measurement Date	Time	Measurement Date	Time	Measurement Date	Time	Measurement Date
11:00 AM - 12:00 PM		0.0021	Sep 07, 2024	0.0016	Sep 08, 2024	0.0016	Sep 09, 2024	0.0009	Sep 10, 2024	0.0008	Sep 11, 2024	0.0008	Sep 12, 2024	0.0008	Sep 13, 2024
12:00 PM - 01:00 PM		0.0012		0.0007		0.0011		0.0006		0.0007		0.0009		0.0007	
01:00 PM - 02:00 PM		0.0020		0.0010		0.0017		0.0021		0.0008		0.0003		0.0002	
02:00 PM - 03:00 PM		0.0020		0.0015		0.0015		0.0016		0.0014		0.0022		0.0011	
03:00 PM - 04:00 PM		0.0022		0.0015		0.0015		0.0003		0.0010		0.0016		0.0004	
04:00 PM - 05:00 PM		0.0015		0.0015		0.0004		0.0002		0.0016		0.0019		0.0018	
05:00 PM - 06:00 PM		0.0007		0.0008		0.0013		0.0008		0.0009		0.0020		0.0021	
06:00 PM - 07:00 PM		0.0006		0.0008		0.0009		0.0007		0.0017		0.0017		0.0012	
07:00 PM - 08:00 PM		0.0010		0.0003		0.0004		0.0011		0.0002		0.0017		0.0004	
08:00 PM - 09:00 PM		0.0003		0.0021		0.0006		0.0016		0.0017		0.0020		<0.0001	
09:00 PM - 10:00 PM		0.0009		0.0010		0.0010		0.0008		0.0011		0.0019		0.0005	
10:00 PM - 11:00 PM		0.0016		0.0022		0.0017		0.0012		0.0015		0.0014		0.0005	
11:00 PM - 12:00 AM		0.0014		0.0019		0.0020		0.0006		0.0011		0.0010		0.0002	
12:00 AM - 01:00 AM		0.0011		0.0021		0.0019		0.0020		0.0019		0.0003		0.0002	
01:00 AM - 02:00 AM		0.0015		0.0017		0.0013		0.0002		0.0022		0.0014		<0.0001	
02:00 AM - 03:00 AM		0.0019		0.0011		0.0011		0.0009		0.0022		0.0013		<0.0001	
03:00 AM - 04:00 AM		0.0019		0.0009		0.0007		0.0006		0.0020		0.0010		<0.0001	
04:00 AM - 05:00 AM		0.0021		0.0008		0.0010		<0.0001		0.0012		0.0014		0.0003	
05:00 AM - 06:00 AM		0.0022		0.0007		0.0016		0.0006		0.0010		0.0007		0.0005	
06:00 AM - 07:00 AM		0.0014		0.0012		0.0018		0.0005		0.0013		0.0012		0.0009	
07:00 AM - 08:00 AM		0.0019		0.0004		0.0010		0.0016		0.0017		0.0009		0.0015	
08:00 AM - 09:00 AM		0.0018		0.0008		0.0008		0.0003		0.0016		0.0003		0.0012	
09:00 AM - 10:00 AM		0.0018		0.0008		0.0018		0.0013		0.0017		0.0014		0.0013	
10:00 AM - 11:00 AM		0.0013		0.0019		0.0002		0.0011		0.0012		0.0001		0.0008	
Average		0.0015		0.0012		0.0012		0.0009		0.0014		0.0012		0.0007	
1hr - Maximum		0.0022		0.0022		0.0020		0.0021		0.0022		0.0022		0.0021	
Standard 1hr - Average		0.170		0.170		0.170		0.170		0.170		0.170		0.170	

Standard : Notification of the National Environment Board No. 33, 2009 (B.E. 2552).

Reference Method : US EPA Method Part 50 App. F (Chemiluminescence)

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Orawan R.

Orawan Rakying
Scientist (3)

Approved by

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong

P/O :
Project Name :
Date Reported : Sep 21, 2024
Report Number: 3118422-1

Page 1 of 1

Sample Description		Air Quality													
Location	Parameter	Paniuwat Wangibong													
Measurement Date	Measurement by	2499736-8		2499736-9		2499736-10		2499736-11		2499736-12		2499736-13		2499736-14	
Time		Sep 07, 2024	Sep 08, 2024	Sep 09, 2024	Sep 10, 2024	Sep 11, 2024	Sep 12, 2024	Sep 13, 2024	Sep 14, 2024	Sep 15, 2024	Sep 16, 2024	Sep 17, 2024	Sep 18, 2024	Sep 19, 2024	Sep 20, 2024
12:00 PM - 01:00 PM	Sulfur Dioxide (ppm)	0.0039	0.0032	0.0039	0.0039	0.0041	0.0039	0.0041	0.0039	0.0039	0.0041	0.0039	0.0041	0.0039	0.0032
01:00 PM - 02:00 PM		0.0033	0.0033	0.0040	0.0040	0.0039	0.0038	0.0035	0.0032	0.0035	0.0038	0.0035	0.0032	0.0035	0.0032
02:00 PM - 03:00 PM		0.0025	0.0036	0.0041	0.0041	0.0039	0.0039	0.0036	0.0032	0.0039	0.0039	0.0036	0.0032	0.0039	0.0032
03:00 PM - 04:00 PM		0.0030	0.0036	0.0039	0.0039	0.0040	0.0039	0.0038	0.0034	0.0039	0.0039	0.0038	0.0034	0.0039	0.0034
04:00 PM - 05:00 PM		0.0028	0.0037	0.0039	0.0039	0.0040	0.0038	0.0039	0.0039	0.0038	0.0039	0.0039	0.0034	0.0039	0.0034
05:00 PM - 06:00 PM		0.0010	0.0036	0.0039	0.0039	0.0040	0.0039	0.0039	0.0039	0.0038	0.0039	0.0039	0.0034	0.0039	0.0034
06:00 PM - 07:00 PM		0.0015	0.0036	0.0040	0.0040	0.0040	0.0040	0.0038	0.0033	0.0040	0.0039	0.0038	0.0033	0.0040	0.0033
07:00 PM - 08:00 PM		0.0019	0.0036	0.0039	0.0039	0.0039	0.0040	0.0039	0.0039	0.0040	0.0039	0.0039	0.0033	0.0040	0.0033
08:00 PM - 09:00 PM		0.0023	0.0038	0.0038	0.0039	0.0039	0.0040	0.0040	0.0040	0.0039	0.0040	0.0040	0.0035	0.0040	0.0035
09:00 PM - 10:00 PM		0.0024	0.0038	0.0039	0.0039	0.0039	0.0039	0.0040	0.0040	0.0039	0.0040	0.0040	0.0034	0.0040	0.0034
10:00 PM - 11:00 PM		0.0026	0.0038	0.0038	0.0039	0.0039	0.0036	0.0039	0.0039	0.0039	0.0039	0.0040	0.0035	0.0040	0.0035
11:00 PM - 12:00 AM	0.0028	0.0037	0.0037	0.0039	0.0038	0.0038	0.0040	0.0040	0.0040	0.0040	0.0040	0.0035	0.0040	0.0035	
12:00 AM - 01:00 AM	0.0030	0.0037	0.0039	0.0039	0.0039	0.0039	0.0038	0.0038	0.0039	0.0038	0.0039	0.0034	0.0040	0.0034	
01:00 AM - 02:00 AM	0.0030	0.0039	0.0039	0.0039	0.0039	0.0040	0.0039	0.0040	0.0040	0.0039	0.0040	0.0036	0.0040	0.0036	
02:00 AM - 03:00 AM	0.0030	0.0038	0.0038	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0040	0.0032	0.0040	0.0032	
03:00 AM - 04:00 AM	0.0033	0.0039	0.0039	0.0039	0.0039	0.0040	0.0039	0.0040	0.0040	0.0040	0.0039	0.0034	0.0040	0.0034	
04:00 AM - 05:00 AM	0.0032	0.0039	0.0039	0.0040	0.0040	0.0041	0.0040	0.0039	0.0040	0.0040	0.0039	0.0036	0.0040	0.0036	
05:00 AM - 06:00 AM	0.0034	0.0038	0.0038	0.0040	0.0040	0.0039	0.0039	0.0040	0.0040	0.0039	0.0040	0.0036	0.0040	0.0036	
06:00 AM - 07:00 AM	0.0034	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0035	0.0040	0.0035	
07:00 AM - 08:00 AM	0.0035	0.0036	0.0038	0.0038	0.0038	0.0039	0.0038	0.0038	0.0039	0.0038	0.0038	0.0035	0.0039	0.0035	
08:00 AM - 09:00 AM	0.0037	0.0038	0.0038	0.0040	0.0040	0.0040	0.0040	0.0039	0.0040	0.0040	0.0039	0.0036	0.0040	0.0036	
09:00 AM - 10:00 AM	0.0037	0.0040	0.0040	0.0040	0.0040	0.0039	0.0041	0.0039	0.0041	0.0041	0.0039	0.0037	0.0041	0.0037	
10:00 AM - 11:00 AM	0.0038	0.0038	0.0040	0.0039	0.0039	0.0040	0.0041	0.0032	0.0041	0.0041	0.0032	0.0035	0.0041	0.0035	
11:00 AM - 12:00 PM	0.0035	0.0039	0.0039	0.0040	0.0040	0.0040	0.0043	0.0033	0.0040	0.0043	0.0033	0.0035	0.0040	0.0035	
Average		0.0029	0.0037	0.0039	0.0039	0.0039	0.0041	0.0038	0.0039	0.0040	0.0038	0.0034	0.0040	0.0034	0.0034
1hr - Maximum		0.0039	0.0040	0.0041	0.0041	0.0041	0.0043	0.0041	0.0041	0.0043	0.0041	0.0037	0.0041	0.0041	0.0037
Standard 1hr - Average		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Standard 24 hrs - Average		0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Standard Reference Method	: Notification of the National Environment Board No.10, 1995 (B.E.2538), No. 21, 2001 (B.E.2544) and No.24, 2004 (B.E.2547).														
	: US EPA Method Part 53 and 58														

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced, stored or full

Approved by

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Orawan Rakyong
Scientist (3)

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272H-122/EMA

S-1 (Reported) Air SO₂ NO_x ml / 4.082PM



Analysis / Test Report

Client : Rojana Industrial Park Public Co., Ltd.
3/7 Moo 2, Rojana Industrial Park (Rayong), Banbung-Bankhai Rd., Nongbua, Bankhai,
Rayong Thailand 21120
P/O : RJN-077/66
Project Name : Rayong Bankhai
Project Location :
Lot ID: 2498841
Date Received : Sep 16, 2024
Date Reported : Sep 20, 2024
Report Number: 3117507-1

Page 1 of 1

Sample Description	2498841-8	2498841-9	2498841-10	2498841-11	2498841-12	2498841-13	2498841-14
Location	๙๙๙๙๙๙ (A2) (GPS 47P 0755473, 1424134)						
Parameter	Sulfur Dioxide (ppm)						
Measurement Date	Sep 07, 2024 - Sep 14, 2024						
Measurement by	Panuwat Wangbong						

Time	Sep 07, 2024	Sep 08, 2024	Sep 09, 2024	Sep 10, 2024	Sep 11, 2024	Sep 12, 2024	Sep 13, 2024
11:00 AM - 12:00 PM	0.0014	0.0017	0.0023	0.0024	0.0023	0.0019	0.0025
12:00 PM - 01:00 PM	0.0028	0.0017	0.0019	0.0023	0.0024	0.0018	0.0028
01:00 PM - 02:00 PM	0.0025	0.0020	0.0019	0.0019	0.0027	0.0029	0.0029
02:00 PM - 03:00 PM	0.0024	0.0020	0.0019	0.0019	0.0038	0.0037	0.0028
03:00 PM - 04:00 PM	0.0026	0.0020	0.0019	0.0018	0.0034	0.0038	0.0029
04:00 PM - 05:00 PM	0.0027	0.0022	0.0020	0.0034	0.0036	0.0036	0.0033
05:00 PM - 06:00 PM	0.0028	0.0028	0.0024	0.0025	0.0032	0.0036	0.0037
06:00 PM - 07:00 PM	0.0031	0.0033	0.0026	0.0033	0.0033	0.0037	0.0031
07:00 PM - 08:00 PM	0.0036	0.0034	0.0030	0.0035	0.0035	0.0036	0.0032
08:00 PM - 09:00 PM	0.0031	0.0036	0.0035	0.0036	0.0032	0.0036	0.0032
09:00 PM - 10:00 PM	0.0033	0.0039	0.0037	0.0036	0.0034	0.0037	0.0032
10:00 PM - 11:00 PM	0.0034	0.0040	0.0031	0.0036	0.0035	0.0035	0.0034
11:00 PM - 12:00 AM	0.0034	0.0037	0.0034	0.0038	0.0034	0.0030	0.0035
12:00 AM - 01:00 AM	0.0036	0.0037	0.0036	0.0034	0.0036	0.0035	0.0036
01:00 AM - 02:00 AM	0.0036	0.0037	0.0037	0.0036	0.0035	0.0037	0.0032
02:00 AM - 03:00 AM	0.0036	0.0036	0.0037	0.0037	0.0035	0.0037	0.0035
03:00 AM - 04:00 AM	0.0036	0.0036	0.0036	0.0035	0.0035	0.0036	0.0034
04:00 AM - 05:00 AM	0.0032	0.0036	0.0036	0.0036	0.0036	0.0035	0.0035
05:00 AM - 06:00 AM	0.0035	0.0037	0.0035	0.0032	0.0035	0.0033	0.0035
06:00 AM - 07:00 AM	0.0035	0.0038	0.0033	0.0035	0.0035	0.0033	0.0031
07:00 AM - 08:00 AM	0.0032	0.0034	0.0032	0.0039	0.0034	0.0029	0.0035
08:00 AM - 09:00 AM	0.0029	0.0037	0.0035	0.0032	0.0036	0.0037	0.0029
09:00 AM - 10:00 AM	0.0022	0.0032	0.0031	0.0026	0.0027	0.0022	0.0031
10:00 AM - 11:00 AM	0.0019	0.0028	0.0025	0.0022	0.0021	0.0022	0.0034
Average	0.0030	0.0031	0.0030	0.0030	0.0033	0.0032	0.0032
1hr - Maximum	0.0036	0.0040	0.0037	0.0039	0.0038	0.0038	0.0037
Standard 1hr - Average	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Standard 24 hrs - Average	0.12	0.12	0.12	0.12	0.12	0.12	0.12

Standard : Notification of the National Environment Board No.10, 1995 (B.E.2538), No. 21, 2001 (B.E.2544) and No.24, 2004 (B.E.2547).

Reference Method : US EPA Method Part 53 and 58

Needs to apply to the sample(s) as submitted, unless the sampling was conducted by ALS. If the sampling was conducted by another party, the results may not be accurate. This report is not reproduced except in full.

Orawan R.

Orawan Rakyong
Scientist (3)

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S:\Report_Ar SONOXR (641PM)



Analysis / Test Report

Client : Rojana Industrial Park Public Co., Ltd.
3/7 Moo 2, Rojana Industrial Park (Rayong), Banbung-Bankhai Rd., Nongbua, Bankhai,
Rayong Thailand 21120
P/O : RJN-077/66
Project Name : Rayong Bankhai
Project Location :
Lot ID: 2498842
Date Received : Sep 16, 2024
Date Reported : Sep 23, 2024
Report Number: 3093565-1

Page 1 of 2

Sample Number	2498842-1 to 7
Parameter	Wind Speed / Wind Direction
Location	๙๙๙๙๙๙ (A2) (GPS 47P 0755473, 1424134)
Sampling Date	Sep 07 - Sep 14, 2024
Sampling by	Panuwat Wangbong

Time	Sep 07, 2024	Sep 08, 2024	Sep 09, 2024	Sep 10, 2024	Sep 11, 2024	Sep 12, 2024	Sep 13, 2024	Sep 14, 2024
11:00 AM - 12:00 PM	WS (m/s) 0.9 WD (deg) 295.0 WNW	WS (m/s) 0.8 WD (deg) 312.0 WNW	WS (m/s) 0.8 WD (deg) 295.0 WNW	WS (m/s) 0.6 WD (deg) 348.0 NNW	WS (m/s) 1.8 WD (deg) 337.0 NNW	WS (m/s) 1.5 WD (deg) 310.0 NW	WS (m/s) 0.5 WD (deg) 352.0 N	WS (m/s) 0.5 WD (deg) 352.0 N
12:00 PM - 01:00 PM	WS (m/s) 0.6 WD (deg) 285.0 WNW	WS (m/s) 1.1 WD (deg) 264.0 W	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.8 WD (deg) 271.0 W	WS (m/s) 2.1 WD (deg) 280.0 W	WS (m/s) 0.3 WD (deg) 16.0 NNE	WS (m/s) 0.9 WD (deg) 359.0 N	WS (m/s) 0.9 WD (deg) 359.0 N
01:00 PM - 02:00 PM	WS (m/s) 0.0 WD (deg) -	WS (m/s) 1.4 WD (deg) 299.0 WNW	WS (m/s) 0.6 WD (deg) 9.0 N	WS (m/s) 1.1 WD (deg) 327.0 NNW	WS (m/s) 1.6 WD (deg) 41.0 NE	WS (m/s) 0.8 WD (deg) 3.0 N	WS (m/s) 0.7 WD (deg) 312.0 NW	WS (m/s) 0.7 WD (deg) 312.0 NW
02:00 PM - 03:00 PM	WS (m/s) 0.4 WD (deg) 354.0 N	WS (m/s) 1.3 WD (deg) 266.0 W	WS (m/s) 0.9 WD (deg) 253.0 WSW	WS (m/s) 1.6 WD (deg) 300.0 WNW	WS (m/s) 1.7 WD (deg) 36.0 NE	WS (m/s) 0.6 WD (deg) 3.0 N	WS (m/s) 1.2 WD (deg) 95.0 E	WS (m/s) 1.2 WD (deg) 95.0 E
03:00 PM - 04:00 PM	WS (m/s) 1.1 WD (deg) 207.0 SSW	WS (m/s) 0.6 WD (deg) 290.0 WSW	WS (m/s) 0.8 WD (deg) 339.0 NNW	WS (m/s) 0.5 WD (deg) 344.0 NNW	WS (m/s) 0.6 WD (deg) 36.0 NE	WS (m/s) 0.7 WD (deg) 30.0 NNE	WS (m/s) 1.5 WD (deg) 260.0 E	WS (m/s) 1.5 WD (deg) 260.0 E
04:00 PM - 05:00 PM	WS (m/s) 0.5 WD (deg) 305.0 NW	WS (m/s) 0.8 WD (deg) 150.0 NNE	WS (m/s) 1.4 WD (deg) 352.0 N	WS (m/s) 0.3 WD (deg) 311.0 NW	WS (m/s) 0.8 WD (deg) 340.0 NE	WS (m/s) 0.6 WD (deg) 24.0 NNE	WS (m/s) 0.7 WD (deg) 359.0 N	WS (m/s) 0.7 WD (deg) 359.0 N
05:00 PM - 06:00 PM	WS (m/s) 0.6 WD (deg) 292.0 WNW	WS (m/s) 0.5 WD (deg) 274.0 W	WS (m/s) 0.8 WD (deg) 9.0 N	WS (m/s) 0.4 WD (deg) 332.0 NNW	WS (m/s) 0.9 WD (deg) 340.0 NE	WS (m/s) 0.9 WD (deg) 23.0 NNE	WS (m/s) 0.9 WD (deg) 359.0 N	WS (m/s) 0.9 WD (deg) 359.0 N
06:00 PM - 07:00 PM	WS (m/s) 0.9 WD (deg) 328.0 NNW	WS (m/s) 0.9 WD (deg) 351.0 N	WS (m/s) 0.3 WD (deg) 305.0 NW	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.7 WD (deg) 320.0 NNE	WS (m/s) 0.4 WD (deg) 22.0 NNE	WS (m/s) 0.6 WD (deg) 358.0 N	WS (m/s) 0.6 WD (deg) 358.0 N
07:00 PM - 08:00 PM	WS (m/s) 0.8 WD (deg) 140.0 NNE	WS (m/s) 0.5 WD (deg) 359.0 N	WS (m/s) 0.4 WD (deg) 306.0 NW	WS (m/s) 0.9 WD (deg) 4.0 N	WS (m/s) 1.0 WD (deg) 31.0 NNE	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.4 WD (deg) 358.0 N	WS (m/s) 0.4 WD (deg) 358.0 N
08:00 PM - 09:00 PM	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.1 WD (deg) -	WS (m/s) 0.5 WD (deg) 307.0 NW	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.5 WD (deg) 31.0 NNE	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.3 WD (deg) 358.0 N	WS (m/s) 0.3 WD (deg) 358.0 N
09:00 PM - 10:00 PM	WS (m/s) 0.5 WD (deg) 346.0 NNW	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.8 WD (deg) 278.0 W	WS (m/s) 0.8 WD (deg) 278.0 W
10:00 PM - 11:00 PM	WS (m/s) 0.9 WD (deg) 288.0 WNW	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.6 WD (deg) 275.0 W	WS (m/s) 0.1 WD (deg) -	WS (m/s) 0.5 WD (deg) 20.0 NNE	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.0 WD (deg) -
11:00 PM - 12:00 AM	WS (m/s) 0.1 WD (deg) -	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.1 WD (deg) -	WS (m/s) 0.8 WD (deg) 271.0 W	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.9 WD (deg) 20.0 NNE	WS (m/s) 1.0 WD (deg) 260.0 W	WS (m/s) 1.0 WD (deg) 260.0 W
12:00 AM - 01:00 AM	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.6 WD (deg) 176.0 S	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.3 WD (deg) 272.0 W	WS (m/s) 0.6 WD (deg) 29.0 NNE	WS (m/s) 0.3 WD (deg) 20.0 NNE	WS (m/s) 0.6 WD (deg) 261.0 W	WS (m/s) 0.6 WD (deg) 261.0 W
01:00 AM - 02:00 AM	WS (m/s) 0.6 WD (deg) 326.0 NW	WS (m/s) 0.5 WD (deg) 173.0 S	WS (m/s) 0.0 WD (deg) -	WS (m/s) 0.7 WD (deg) 272.0 W	WS (m/s) 0.9 WD (deg) 357.0 N	WS (m/s) 0.8 WD (deg) 20.0 NNE	WS (m/s) 0.8 WD (deg) 352.0 N	WS (m/s) 0.8 WD (deg) 352.0 N
02:00 AM - 03:00 AM	WS (m/s) 0.8 WD (deg) 327.0 NNW	WS (m/s) 0.3 WD (deg) 172.0 S	WS (m/s) 0.6 WD (deg) 309.0 NW	WS (m/s) 0.6 WD (deg) 273.0 W	WS (m/s) 0.8 WD (deg) 359.0 N	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.9 WD (deg) 350.0 N	WS (m/s) 0.9 WD (deg) 350.0 N
03:00 AM - 04:00 AM	WS (m/s) 0.9 WD (deg) 326.0 NW	WS (m/s) 0.9 WD (deg) 170.0 S	WS (m/s) 0.4 WD (deg) 309.0 NW	WS (m/s) 0.8 WD (deg) 275.0 W	WS (m/s) 1.0 WD (deg) 359.0 N	WS (m/s) 0.6 WD (deg) 19.0 NNE	WS (m/s) 1.1 WD (deg) 299.0 WNW	WS (m/s) 1.1 WD (deg) 299.0 WNW
04:00 AM - 05:00 AM	WS (m/s) 0.5 WD (deg) 276.0 W	WS (m/s) 0.7 WD (deg) 162.0 SSE	WS (m/s) 0.3 WD (deg) 309.0 NW	WS (m/s) 0.2 WD (deg) -	WS (m/s) 0.6 WD (deg) 359.0 N	WS (m/s) 0.5 WD (deg) 19.0 NNE	WS (m/s) 1.5 WD (deg) 299.0 WNW	WS (m/s) 1.5 WD (deg) 299.0 WNW
05:00 AM - 06:00 AM	WS (m/s) 1.1 WD (deg) 278.0 W	WS (m/s) 0.5 WD (deg) 163.0 SSE	WS (m/s) 0.8 WD (deg) 309.0 NW	WS (m/s) 0.9 WD (deg) 275.0 W	WS (m/s) 0.3 WD (deg) 359.0 N	WS (m/s) 0.9 WD (deg) 18.0 NNE	WS (m/s) 0.9 WD (deg) 299.0 WNW	WS (m/s) 0.9 WD (deg) 299.0 WNW
06:00 AM - 07:00 AM	WS (m/s) 1.3 WD (deg) 302.0 WNW	WS (m/s) 0.6 WD (deg) 170.0 S	WS (m/s) 1.2 WD (deg) 310.0 NW	WS (m/s) 0.7 WD (deg) 276.0 W	WS (m/s) 0.8 WD (deg) 359.0 N	WS (m/s) 0.7 WD (deg) 18.0 NNE	WS (m/s) 1.3 WD (deg) 299.0 WNW	WS (m/s) 1.3 WD (deg) 299.0 WNW
07:00 AM - 08:00 AM	WS (m/s) 0.2 WD (deg) -	WS (m/s) 1.1 WD (deg) 165.0 SSE	WS (m/s) 1.8 WD (deg) 309.0 NW	WS (m/s) 1.1 WD (deg) 276.0 W	WS (m/s) 1.1 WD (deg) 359.0 N	WS (m/s) 0.5 WD (deg) 16.0 NNE	WS (m/s) 0.7 WD (deg) 306.0 NW	WS (m/s) 0.7 WD (deg) 306.0 NW
08:00 AM - 09:00 AM	WS (m/s) 0.5 WD (deg) 261.0 W	WS (m/s) 1.6 WD (deg) 357.0 N	WS (m/s) 1.3 WD (deg) 312.0 NW	WS (m/s) 0.6 WD (deg) 339.0 NNW	WS (m/s) 0.6 WD (deg) 359.0 N	WS (m/s) 0.1 WD (deg) -	WS (m/s) 0.6 WD (deg) 309.0 NW	WS (m/s) 0.6 WD (deg) 309.0 NW
09:00 AM - 10:00 AM	WS (m/s) 0.6 WD (deg) 290.0 WNW	WS (m/s) 1.1 WD (deg) 309.0 NW	WS (m/s) 1.5 WD (deg) 219.0 SW	WS (m/s) 0.8 WD (deg) 337.0 NNW	WS (m/s) 0.7 WD (deg) 5.0 N	WS (m/s) 0.3 WD (deg) 293.0 WNW	WS (m/s) 1.1 WD (deg) 315.0 NW	WS (m/s) 1.1 WD (deg) 315.0 NW
10:00 AM - 11:00 AM	WS (m/s) 0.9 WD (deg) 299.0 WNW	WS (m/s) 0.6 WD (deg) 288.0 W	WS (m/s) 0.2 WD (deg) -	WS (m/s) 1.2 WD (deg) 300.0 WNW	WS (m/s) 1.3 WD (deg) 352.0 N	WS (m/s) 0.8 WD (deg) 327.0 NW	WS (m/s) 1.5 WD (deg) 302.0 WNW	WS (m/s) 1.5 WD (deg) 302.0 WNW

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

The above results are valid only for the wind speed and direction as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that all sampling results be used in conjunction with the ALS Laboratory Group (Thailand) Quality Management System (QMS) and that this report is not reproduced except in full.

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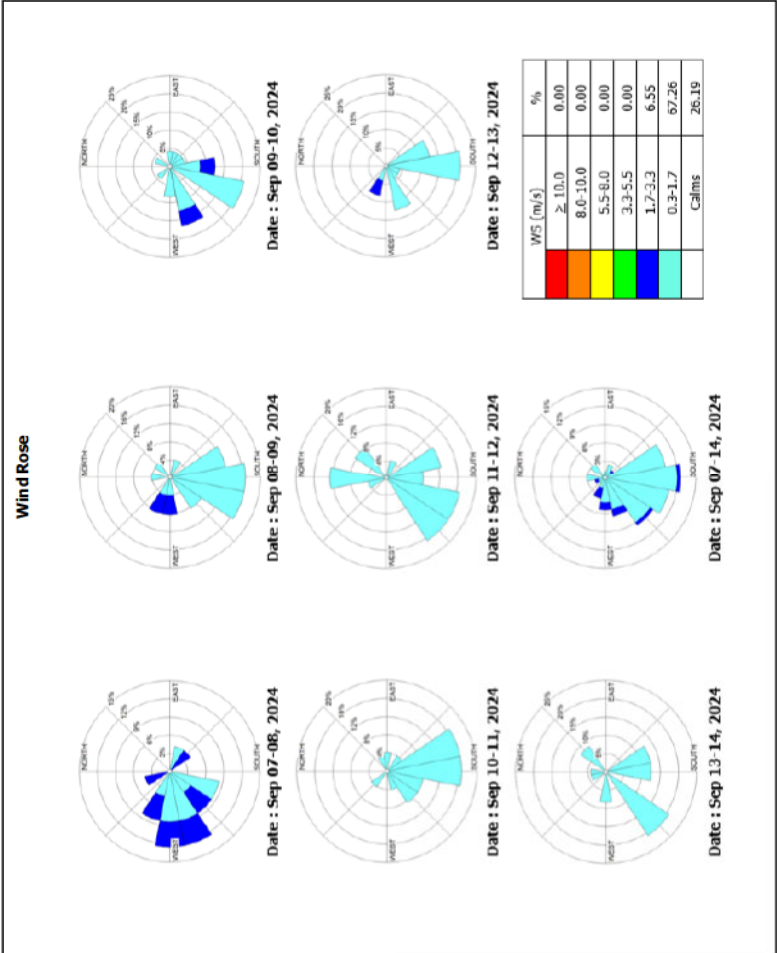
Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

Lot ID: 24101603
Date Received :Sep 16, 2024
Date Reported :Sep 23, 2024
Report Number :3098970-1

P/O :
Project Name :
Project Location :

Page 2 of 2



This report is valid only for the analyzed samples. It is not valid for other samples without written consent from the Laboratory. ALS Laboratory Group (Thailand) Ltd. strongly recommends that this report is not introduced except in full.

Approved by

Sarayuth Jitranont
Assistant General Manager

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ภาคผนวก ค-2

คุณภาพอากาศจากปล่องระบาย



Analysis / Test Report

Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :

P/O :

Project Name :

Project Name :

Project Location :

Project Location :

TESTING
No.0042

Lot ID: 2499744

Date Received : Sep 09, 2024

Date Reported : Sep 17, 2024

Report Number: 3095341-1

TESTING
No.0042

Lot ID: 2499744

Date Received : Sep 09, 2024

Date Reported : Sep 17, 2024

Report Number: 3095341-1

Page 1 of 4

Page 2 of 4

Sample Number 2499744-1

Sampled Date Sep 09, 2024

Sample Description Emission from Stationary Source

Location อู่การเคลือบสีรถยนต์และชิ้นส่วน FGD (Flue Gas Desulfurization) phase I

Date Analysis Commenced Sep 10, 2024

Condition of Sample Extracted into two 2-L collection flasks, one filter paper placed in plastic petri dish, one 10-L air sampling bag and one amber plastic bottle, refrigerated

Stack Description

Ambient Pressure	752	mmHg	Diameter	2.00	m	Oxygen	5.8	%
Ambient Temperature	33.6	°C	Shape	Circle		Carbon Dioxide	11.4	%
Type of Process	Combustion		Stack Temperature	67.0	°C	Gas Velocity	14.0	m/s
Type of Fuel	Fuel Oil		Moisture	50.29	%	Flow Rate (Actual O2)	68176	Nm3/hr

Analyte	Sampled Time	Unit	LOQ (LOR)	Result at 7% w.o. at 5.8 % O ₂	Guideline (1)	Method	Testing Location
---------	--------------	------	-----------	---	---------------	--------	------------------

Air Testing	Carbon Monoxide *	02:30 PM - 02:40 PM	ppm	1.0	103	111.89	690	-	United States Environmental Protection Agency, EPA Method 10	Rayong
	Carbon Monoxide *	02:30 PM - 02:40 PM	mg/m3	1.1	118	128.19	-	-	United States Environmental Protection Agency, EPA Method 10	Rayong
Oxides of Nitrogen *	Oxides of Nitrogen *	02:20 PM - 02:30 PM	mg/m3	2.0	239	259.63	376	282	United States Environmental Protection Agency, EPA Method 10	Rayong
	Oxides of Nitrogen *	02:20 PM - 02:30 PM	ppm	1.06	127	137.96	200	-	United States Environmental Protection Agency, EPA Method 7	Rayong
Sulfur dioxide *	Sulfur dioxide *	01:50 PM - 02:20 PM	mg/m3	5.0	19.5	21.18	2487	170	United States Environmental Protection Agency, EPA Method 6	Rayong
	Sulfur dioxide *	01:50 PM - 02:20 PM	ppm	2.0	7.45	8.09	950	-	United States Environmental Protection Agency, EPA Method 6	Rayong

Technical Management

Tharitat.

Tharita Kulsriwong

Scientist (4)

๖๓๓๓๓๓๓ ๖-323-๔-0029

Approved by

Tharitat.

Dej Chongchon

Senior Manager

๖๓๓๓๓๓๓ ๖-323-๔-0001

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory.

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S:\Reports\Air_Spec_02_2024.rpt (11/29AM)

S:\Reports\Air_Spec_02_2024.rpt (11/29AM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O :
Project Name :
Project Location :

TESTING
No.0042
Lot ID: 2499744
Date Received : Sep 09, 2024
Date Reported : Sep 17, 2024
Report Number: 3095341-1

Page 3 of 4

Sample Number	2499744-1
Sampled Date	Sep 09, 2024
Sample Description	Emission from Stationary Source
Location	โรงงานผลิตยางรถยนต์ (Flue Gas Desulfurization) phase I
Date Analysis Commenced	Sep 10, 2024
Condition of Sample	Extracted into two 2-L collection flasks, one filter paper placed in plastic petri dish, one 10-L air sampling bag and one amber plastic bottle, refrigerated

Stack Description					
Ambient Pressure	752	mmHg	Diameter	2.00	m
Ambient Temperature	33.6	°C	Shape	Circle	
Type of Process	Combustion		Stack Temperature	67.0	°C
Type of Fuel	Fuel Oil		Moisture	50.29	%
Flow Rate (Actual O2)					%
Gas Velocity					m/s
Flow Rate (Actual O2)					Nm3/hr

Analyte	Sampled Time	Unit	LOQ (LOR)	Result Emission Rate	Guideline (1)	Method (2)	Testing Location
Air Testing							
Carbon Monoxide *	02:30 PM - 02:40 PM	kg/day	-	169	-	Calculated	Rayong
Carbon Monoxide *	02:30 PM - 02:40 PM	g/s	-	1.96	-	Calculated	Rayong
Oxides of Nitrogen *	02:20 PM - 02:30 PM	g/s	-	4.941	-	6.252	Rayong
Oxides of Nitrogen *	02:20 PM - 02:30 PM	kg/day	-	427	-	Calculated	Rayong
Sulfur dioxide *	01:50 PM - 02:20 PM	g/s	-	0.403	-	3.769	Rayong
Sulfur Dioxide *	01:50 PM - 02:20 PM	kg/day	-	36.7	-	Calculated	Rayong
Total Suspended Particulate *	01:45 PM - 02:45 PM	g/s	-	0.53	-	2.22	Rayong
Total Suspended Particulate *	01:45 PM - 02:45 PM	kg/day	-	46.1	-	Calculated	Rayong

Guideline :

- 1) Notification of the Ministry of Industry 2006 (B.E. 2549) Published in the Royal Government Gazette, Vol.123 Special Part 125 D, dated December 4, 2006 (B.E. 2549)
2) Emission Air Standard according to EIA, Approval Letter No. Tor Sor 1009.9/3085 dated March 11, B.E. 2556

Sampling By : Suddamrong Chokpitthan วิดีโอเลขที่ 7-323-4-0037

Remark :

- LOD : Limit of Detection
- "C" : Lower than LOQ (Limit of Quantization) / LOR (Limit of Reporting)

Thanitak.

Technical Management

Thanita Kusurivong
Scientist (4)
วิดีโอเลขที่ 7-323-4-0029

Approved by

Dej Changdon
Senior Manager
วิดีโอเลขที่ 7-323-4-0001

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O :
Project Name :
Project Location :

TESTING
No.0042
Lot ID: 2499744
Date Received : Sep 09, 2024
Date Reported : Sep 17, 2024
Report Number: 3095341-1

Page 4 of 4

Sample Number	2499744-1
Sampled Date	Sep 09, 2024
Sample Description	Emission from Stationary Source
Location	โรงงานผลิตยางรถยนต์ (Flue Gas Desulfurization) phase I
Date Analysis Commenced	Sep 10, 2024
Condition of Sample	Extracted into two 2-L collection flasks, one filter paper placed in plastic petri dish, one 10-L air sampling bag and one amber plastic bottle, refrigerated

Stack Description					
Ambient Pressure	752	mmHg	Diameter	2.00	m
Ambient Temperature	33.6	°C	Shape	Circle	
Type of Process	Combustion		Stack Temperature	67.0	°C
Type of Fuel	Fuel Oil		Moisture	50.29	%
Flow Rate (Actual O2)					%
Gas Velocity					m/s
Flow Rate (Actual O2)					Nm3/hr

Analyte	Sampled Time	Unit	LOQ (LOR)	Result Emission Rate	Guideline (1)	Method (2)	Testing Location
---------	--------------	------	-----------	----------------------	---------------	------------	------------------

- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.

Thanitak.

Technical Management

Thanita Kusurivong
Scientist (4)
วิดีโอเลขที่ 7-323-4-0029

Approved by

Dej Changdon
Senior Manager
วิดีโอเลขที่ 7-323-4-0001

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SIReports_Air_Spec_02_2024.rpt (11/29AM)

ภาคผนวก ค-3

ระดับเสียงโดยทั่วไป



TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114616-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number	2499753-1
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณหน้าห้อง (N1) (GPS 47P 0754868, 1414634)
Measurement Date	Sep 07 - Sep 08, 2024
Measurement by	Paruwat Wangdong
Sound Level meter	Serial No. 1222724

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	61.1	77.4	51.7
12:00 PM - 01:00 PM	61.4	75.2	51.4
01:00 PM - 02:00 PM	64.5	91.3	60.2
02:00 PM - 03:00 PM	67.5	92.3	62.1
03:00 PM - 04:00 PM	64.8	92.9	60.8
04:00 PM - 05:00 PM	66.7	82.9	60.3
05:00 PM - 06:00 PM	63.3	79.8	56.4
06:00 PM - 07:00 PM	54.8	82.5	52.0
07:00 PM - 08:00 PM	47.0	68.3	43.1
08:00 PM - 09:00 PM	45.3	77.0	42.6
09:00 PM - 10:00 PM	44.8	57.5	43.0
10:00 PM - 11:00 PM	42.9	52.3	41.5
11:00 PM - 12:00 AM	44.5	64.8	41.3
12:00 AM - 01:00 AM	43.2	68.2	40.4
01:00 AM - 02:00 AM	41.9	65.1	40.0
02:00 AM - 03:00 AM	43.1	75.8	38.7
03:00 AM - 04:00 AM	39.8	55.5	38.7
04:00 AM - 05:00 AM	45.1	80.8	38.8
05:00 AM - 06:00 AM	46.7	78.1	40.4
06:00 AM - 07:00 AM	50.7	82.8	41.3
07:00 AM - 08:00 AM	52.8	69.0	50.4
08:00 AM - 09:00 AM	55.0	70.1	52.2
09:00 AM - 10:00 AM	58.9	76.5	43.3
10:00 AM - 11:00 AM	62.4	79.1	44.5
Leq Average 24 hrs. (dB(A))	60.0		
Lmax (dB(A))	92.9		43.1
L90 (dB(A))			
Ldn (dB(A))	60.4		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งไทย (พ.ศ. 2540) ข้อกำหนดมาตรฐานสิ่งแวดล้อมโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งไทย (พ.ศ. 2540) ข้อกำหนดมาตรฐานสิ่งแวดล้อมโดยทั่วไป
โดย พ.ร.บ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

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S:\Reports_Air Noise\pr (4.61PM)



TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114617-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number	2499753-2
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณหน้าห้อง (N1) (GPS 47P 0754868, 1424534)
Measurement Date	Sep 08 - Sep 09, 2024
Measurement by	Paruwat Wangdong
Sound Level meter	Serial No. 1222724

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	50.8	72.2	43.0
12:00 PM - 01:00 PM	52.8	79.3	44.4
01:00 PM - 02:00 PM	51.4	71.7	43.8
02:00 PM - 03:00 PM	50.9	76.7	43.2
03:00 PM - 04:00 PM	50.8	81.0	47.9
04:00 PM - 05:00 PM	61.7	75.9	55.5
05:00 PM - 06:00 PM	57.1	71.9	55.9
06:00 PM - 07:00 PM	60.0	69.1	49.8
07:00 PM - 08:00 PM	54.0	60.1	45.2
08:00 PM - 09:00 PM	47.2	58.4	46.5
09:00 PM - 10:00 PM	49.5	62.8	46.2
10:00 PM - 11:00 PM	48.0	73.5	43.5
11:00 PM - 12:00 AM	46.4	60.6	41.8
12:00 AM - 01:00 AM	54.3	65.4	45.1
01:00 AM - 02:00 AM	64.5	68.8	63.0
02:00 AM - 03:00 AM	67.1	69.9	66.2
03:00 AM - 04:00 AM	67.1	69.9	65.5
04:00 AM - 05:00 AM	63.6	69.8	62.0
05:00 AM - 06:00 AM	58.4	75.4	42.4
06:00 AM - 07:00 AM	48.0	95.4	44.3
07:00 AM - 08:00 AM	53.9	78.1	47.2
08:00 AM - 09:00 AM	57.9	79.5	47.2
09:00 AM - 10:00 AM	60.5	79.1	56.1
10:00 AM - 11:00 AM			
Leq Average 24 hrs. (dB(A))	59.7		
Lmax (dB(A))	95.4		46.2
L90 (dB(A))			
Ldn (dB(A))	68.4		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งไทย (พ.ศ. 2540) ข้อกำหนดมาตรฐานสิ่งแวดล้อมโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งไทย (พ.ศ. 2540) ข้อกำหนดมาตรฐานสิ่งแวดล้อมโดยทั่วไป
โดย พ.ร.บ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

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TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114618-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O :
Project Name :
Project Location :

Sample Number	2499753-3
Parameter	Noise (Leq 24 hrs.)
Location	วัดสนามหญ้าใหญ่ (N1) (GPS 47P 0754868, 1414634)
Measurement Date	Sep 09 - Sep 10, 2024
Measurement by	Paruwat Wangdong
Sound Level meter	Serial No. 1222724

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	58.0	81.6	51.7
12:00 PM - 01:00 PM	59.8	86.1	54.5
01:00 PM - 02:00 PM	61.4	89.8	55.5
02:00 PM - 03:00 PM	62.1	79.2	58.6
03:00 PM - 04:00 PM	65.1	92.0	57.9
04:00 PM - 05:00 PM	57.1	87.6	51.1
05:00 PM - 06:00 PM	44.3	72.0	39.8
06:00 PM - 07:00 PM	43.1	68.9	40.4
07:00 PM - 08:00 PM	46.3	56.1	45.5
08:00 PM - 09:00 PM	47.5	68.0	45.6
09:00 PM - 10:00 PM	44.5	60.5	42.5
10:00 PM - 11:00 PM	45.2	60.5	44.0
11:00 PM - 12:00 AM	47.6	69.1	42.2
12:00 AM - 01:00 AM	43.6	64.4	42.1
01:00 AM - 02:00 AM	43.1	64.4	41.0
02:00 AM - 03:00 AM	44.4	62.9	42.8
03:00 AM - 04:00 AM	45.4	58.2	42.2
04:00 AM - 05:00 AM	48.4	72.1	43.8
05:00 AM - 06:00 AM	44.2	66.5	42.9
06:00 AM - 07:00 AM	44.4	68.9	42.5
07:00 AM - 08:00 AM	50.4	78.9	43.2
08:00 AM - 09:00 AM	93.3	93.3	50.5
09:00 AM - 10:00 AM	60.7	92.8	50.6
10:00 AM - 11:00 AM	58.1	84.3	52.1
Leq Average 24 hrs. (dB(A))	57.3		
Lmax (dB(A))	93.3		43.8
L90 (dB(A))			
Ldn (dB(A))	58.2		
Standard (dB(A))	70		115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) สำหรับมาตรฐานชุมชนเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) สำหรับมาตรฐานชุมชนเสียงโดยทั่วไป
โดย พ.ร.บ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Supt S.

Supot Salameh
Section Head

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

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TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114619-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O :
Project Name :
Project Location :

Sample Number	2499753-4
Parameter	Noise (Leq 24 hrs.)
Location	วัดสนามหญ้าใหญ่ (N1) (GPS 47P 0754868, 1424534)
Measurement Date	Sep 10 - Sep 11, 2024
Measurement by	Paruwat Wangdong
Sound Level meter	Serial No. 1222724

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	60.8	96.0	51.8
12:00 PM - 01:00 PM	57.1	89.8	46.4
01:00 PM - 02:00 PM	57.5	90.0	50.2
02:00 PM - 03:00 PM	59.1	84.2	52.8
03:00 PM - 04:00 PM	60.2	98.2	50.1
04:00 PM - 05:00 PM	57.8	86.1	49.0
05:00 PM - 06:00 PM	50.5	79.4	45.6
06:00 PM - 07:00 PM	50.4	72.9	43.8
07:00 PM - 08:00 PM	52.3	71.9	47.1
08:00 PM - 09:00 PM	46.0	70.3	46.0
09:00 PM - 10:00 PM	48.6	67.9	44.9
10:00 PM - 11:00 PM	42.8	58.9	41.0
11:00 PM - 12:00 AM	43.0	61.8	38.8
12:00 AM - 01:00 AM	44.6	60.3	39.0
01:00 AM - 02:00 AM	43.4	58.9	38.1
02:00 AM - 03:00 AM	42.2	64.2	37.4
03:00 AM - 04:00 AM	45.4	66.1	39.3
04:00 AM - 05:00 AM	53.2	60.6	45.3
05:00 AM - 06:00 AM	49.1	68.4	42.3
06:00 AM - 07:00 AM	45.8	75.0	41.7
07:00 AM - 08:00 AM	50.1	76.7	45.6
08:00 AM - 09:00 AM	53.3	82.2	47.0
09:00 AM - 10:00 AM	56.0	81.4	49.5
10:00 AM - 11:00 AM	59.1	85.4	50.5
Leq Average 24 hrs. (dB(A))	54.8		
Lmax (dB(A))	98.2		45.6
L90 (dB(A))			
Ldn (dB(A))	56.8		
Standard (dB(A))	70		115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) สำหรับมาตรฐานชุมชนเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) สำหรับมาตรฐานชุมชนเสียงโดยทั่วไป
โดย พ.ร.บ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

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TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114620-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :

Project Name :

Project Location :

Sample Number	2499753-5
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณพื้นที่ใกล้ (N1) (GPS 47P 0754868, 1414634)
Measurement Date	Sep 11 - Sep 12, 2024
Measurement by	Paruwat Wangdong
Sound Level meter	Serial No. 1222724

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	54.2	81.1	49.2
12:00 PM - 01:00 PM	60.2	83.9	54.0
01:00 PM - 02:00 PM	61.1	81.5	55.1
02:00 PM - 03:00 PM	55.9	74.4	52.9
03:00 PM - 04:00 PM	61.3	86.7	57.7
04:00 PM - 05:00 PM	61.3	81.8	58.5
05:00 PM - 06:00 PM	62.6	84.1	57.2
06:00 PM - 07:00 PM	61.1	85.9	57.3
07:00 PM - 08:00 PM	59.8	81.8	57.0
08:00 PM - 09:00 PM	56.6	75.9	53.1
09:00 PM - 10:00 PM	55.9	66.9	52.8
10:00 PM - 11:00 PM	60.5	73.6	54.2
11:00 PM - 12:00 AM	63.7	70.8	59.8
12:00 AM - 01:00 AM	66.1	72.0	62.8
01:00 AM - 02:00 AM	66.8	72.5	63.7
02:00 AM - 03:00 AM	66.7	74.4	63.3
03:00 AM - 04:00 AM	67.3	71.6	62.0
04:00 AM - 05:00 AM	67.3	73.7	64.4
05:00 AM - 06:00 AM	67.0	73.7	64.4
06:00 AM - 07:00 AM	46.4	66.8	43.1
07:00 AM - 08:00 AM	53.1	80.2	42.6
08:00 AM - 09:00 AM	56.8	78.7	52.9
09:00 AM - 10:00 AM	65.8	86.0	62.5
10:00 AM - 11:00 AM	65.4	84.6	62.5

Leq Average 24 hrs. (dB(A))	63.2
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Lmax (dB(A))	86.7
L90 (dB(A))	57.2
Ldn (dB(A))	

Standard (dB(A))	115
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Reference Method : ISO1996-1 and 1996-2

Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป

โดย พ.ร.บ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

Life Sciences

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2721-121/ BML

S:\Reports_Air Noise pr (4.82PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :

Project Name :

Project Location :

Sample Number	2499753-6
Parameter	Noise (Leq 24 hrs.)
Location	บริเวณพื้นที่ใกล้ (N1) (GPS 47P 0754868, 1424534)
Measurement Date	Sep 12 - Sep 13, 2024
Measurement by	Paruwat Wangdong
Sound Level meter	Serial No. 1222724

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	65.3	87.9	61.3
12:00 PM - 01:00 PM	64.7	81.6	61.2
01:00 PM - 02:00 PM	65.9	83.4	63.3
02:00 PM - 03:00 PM	64.0	80.4	61.6
03:00 PM - 04:00 PM	63.6	82.5	60.0
04:00 PM - 05:00 PM	60.4	80.1	56.7
05:00 PM - 06:00 PM	57.1	75.8	54.2
06:00 PM - 07:00 PM	56.9	84.8	43.5
07:00 PM - 08:00 PM	56.0	88.2	45.2
08:00 PM - 09:00 PM	48.2	55.1	47.5
09:00 PM - 10:00 PM	50.2	63.5	48.7
10:00 PM - 11:00 PM	47.9	69.3	46.6
11:00 PM - 12:00 AM	46.4	58.6	44.9
12:00 AM - 01:00 AM	45.6	57.7	43.4
01:00 AM - 02:00 AM	57.7	90.1	47.0
02:00 AM - 03:00 AM	59.3	64.9	55.0
03:00 AM - 04:00 AM	59.4	65.0	55.3
04:00 AM - 05:00 AM	54.7	62.4	48.9
05:00 AM - 06:00 AM	46.3	65.6	42.8
06:00 AM - 07:00 AM	59.4	100.9	38.6
07:00 AM - 08:00 AM	43.2	74.7	36.4
08:00 AM - 09:00 AM	55.7	83.0	51.6
09:00 AM - 10:00 AM	57.9	80.5	54.4
10:00 AM - 11:00 AM	64.6	84.9	59.5

Leq Average 24 hrs. (dB(A))	60.2
-----------------------------	------

Lmax (dB(A))	100.9
L90 (dB(A))	48.9
Ldn (dB(A))	

Standard (dB(A))	115
------------------	-----

Reference Method : ISO1996-1 and 1996-2

Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป

โดย พ.ร.บ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

Life Sciences

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S:\Reports_Air Noise pr (4.82PM)



TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114622-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nonggoua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number : 2499753-7

Parameter : Noise (Leq 24 hrs.)
Location : บ้านนาใหม่ (N1) (GPS 47P 0754888, 1414634)
Measurement Date : Sep 13 - Sep 14, 2024
Measurement by : Panuwat Wangdong
Sound Level meter : Serial No. 122224

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	61.3	79.7	57.9
12:00 PM - 01:00 PM	56.6	79.9	53.1
01:00 PM - 02:00 PM	50.3	86.9	54.3
02:00 PM - 03:00 PM	63.1	87.4	55.4
03:00 PM - 04:00 PM	57.2	80.1	51.5
04:00 PM - 05:00 PM	55.7	80.9	49.7
05:00 PM - 06:00 PM	52.3	77.9	46.5
06:00 PM - 07:00 PM	50.0	76.4	42.7
07:00 PM - 08:00 PM	47.5	61.4	44.9
08:00 PM - 09:00 PM	49.6	60.3	45.3
09:00 PM - 10:00 PM	48.5	61.2	45.1
10:00 PM - 11:00 PM	48.9	67.5	43.5
11:00 PM - 12:00 AM	49.9	65.9	42.0
12:00 AM - 01:00 AM	47.1	70.4	40.7
01:00 AM - 02:00 AM	46.8	63.7	41.5
02:00 AM - 03:00 AM	63.6	69.1	60.9
03:00 AM - 04:00 AM	66.1	71.7	62.9
04:00 AM - 05:00 AM	61.6	70.4	57.5
05:00 AM - 06:00 AM	51.0	62.3	45.8
06:00 AM - 07:00 AM	44.1	61.7	39.1
07:00 AM - 08:00 AM	44.2	66.0	37.1
08:00 AM - 09:00 AM	41.7	63.8	35.4
09:00 AM - 10:00 AM	46.2	66.6	40.3
10:00 AM - 11:00 AM	51.1	81.5	39.9

Leq Average 24 hrs. (dB(A)) : 57.8

Lmax (dB(A)) : 87.4

L90 (dB(A)) : 45.1

Ldn (dB(A)) : 115

Standard (dB(A)) : 70

Reference Method : ISO1996-1 and 1996-2

Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

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S:\Reports_Air Noise pr (4.60PM)



TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114623-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nonggoua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number : 2499753-8

Parameter : Noise (Leq 24 hrs.)
Location : บ้านนาใหม่ (N2) (GPS 47P 0751159, 1425557)
Measurement Date : Sep 07 - Sep 08, 2024
Measurement by : Panuwat Wangdong
Sound Level meter : Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	62.1	73.0	44.5
01:00 PM - 02:00 PM	59.6	72.2	46.1
02:00 PM - 03:00 PM	58.5	75.3	48.9
03:00 PM - 04:00 PM	56.5	63.3	55.8
04:00 PM - 05:00 PM	55.7	65.6	55.1
05:00 PM - 06:00 PM	53.4	69.3	51.8
06:00 PM - 07:00 PM	51.5	71.6	45.0
07:00 PM - 08:00 PM	51.9	61.5	50.7
08:00 PM - 09:00 PM	50.7	60.5	49.0
09:00 PM - 10:00 PM	51.8	60.7	50.0
10:00 PM - 11:00 PM	48.2	67.5	42.0
11:00 PM - 12:00 AM	46.0	59.9	44.0
12:00 AM - 01:00 AM	47.0	66.9	44.3
01:00 AM - 02:00 AM	46.3	60.5	44.3
02:00 AM - 03:00 AM	46.0	59.9	44.0
03:00 AM - 04:00 AM	44.3	60.1	41.7
04:00 AM - 05:00 AM	45.7	66.1	40.5
05:00 AM - 06:00 AM	44.8	65.6	38.9
06:00 AM - 07:00 AM	45.9	62.4	43.3
07:00 AM - 08:00 AM	46.5	58.9	44.3
08:00 AM - 09:00 AM	50.4	64.8	47.6
09:00 AM - 10:00 AM	51.7	65.1	49.7
10:00 AM - 11:00 AM	52.0	64.0	50.5
11:00 AM - 12:00 PM	58.5	75.3	48.9

Leq Average 24 hrs. (dB(A)) : 54.2

Lmax (dB(A)) : 75.3

L90 (dB(A)) : 45.0

Ldn (dB(A)) : 115

Standard (dB(A)) : 70

Reference Method : ISO1996-1 and 1996-2

Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

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TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114624-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number	2499753-9
Parameter	Noise (Leq 24 hrs.)
Location	บ้านนาบัว (N2) (GPS 47P 0751159, 1425557)
Measurement Date	Sep 08 - Sep 09, 2024
Measurement by	Paruwat Wanghong
Sound Level meter	Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	60.2	80.0	55.7
01:00 PM - 02:00 PM	59.0	78.8	54.5
02:00 PM - 03:00 PM	59.3	69.8	45.3
03:00 PM - 04:00 PM	57.3	74.1	47.7
04:00 PM - 05:00 PM	55.4	71.1	43.4
05:00 PM - 06:00 PM	53.5	70.2	44.6
06:00 PM - 07:00 PM	50.7	65.1	47.9
07:00 PM - 08:00 PM	52.0	65.4	50.0
08:00 PM - 09:00 PM	51.9	64.3	48.9
09:00 PM - 10:00 PM	48.8	64.5	45.2
10:00 PM - 11:00 PM	47.8	62.0	43.9
11:00 PM - 12:00 AM	48.4	63.2	44.3
12:00 AM - 01:00 AM	45.1	59.3	42.1
01:00 AM - 02:00 AM	44.4	60.2	42.0
02:00 AM - 03:00 AM	45.9	55.9	43.5
03:00 AM - 04:00 AM	47.1	58.1	44.7
04:00 AM - 05:00 AM	46.8	61.7	44.7
05:00 AM - 06:00 AM	47.7	60.8	45.1
06:00 AM - 07:00 AM	46.6	61.3	45.0
07:00 AM - 08:00 AM	49.6	69.8	44.9
08:00 AM - 09:00 AM	52.3	70.2	45.8
09:00 AM - 10:00 AM	52.2	61.8	50.7
10:00 AM - 11:00 AM	57.1	87.5	51.2
11:00 AM - 12:00 PM	60.5	71.0	46.5

Leq Average 24 hrs. (dB(A))	54.5
Lmax (dB(A))	87.5
L90 (dB(A))	45.1
Ldn (dB(A))	
Standard (dB(A))	115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งปี 15 (พ.ศ. 2540) ค่ากำหนดมาตรฐานเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งปี 15 (พ.ศ. 2540) ค่ากำหนดมาตรฐานเสียงโดยทั่วไป
โดย พ.ร.บ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

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TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114625-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number	2499753-10
Parameter	Noise (Leq 24 hrs.)
Location	บ้านนาบัว (N2) (GPS 47P 0751159, 1425557)
Measurement Date	Sep 09 - Sep 10, 2024
Measurement by	Paruwat Wanghong
Sound Level meter	Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	66.5	76.5	48.8
01:00 PM - 02:00 PM	53.1	69.0	51.5
02:00 PM - 03:00 PM	48.5	64.0	48.6
03:00 PM - 04:00 PM	47.5	61.7	44.9
04:00 PM - 05:00 PM	46.1	62.9	43.6
05:00 PM - 06:00 PM	59.3	71.9	44.0
06:00 PM - 07:00 PM	51.2	71.3	45.8
07:00 PM - 08:00 PM	50.8	72.9	44.7
08:00 PM - 09:00 PM	50.3	72.9	48.1
09:00 PM - 10:00 PM	53.9	67.2	44.7
10:00 PM - 11:00 PM	47.9	65.6	44.3
11:00 PM - 12:00 AM	46.7	58.9	43.8
12:00 AM - 01:00 AM	46.0	59.8	44.1
01:00 AM - 02:00 AM	46.1	61.0	44.0
02:00 AM - 03:00 AM	45.9	62.4	43.3
03:00 AM - 04:00 AM	45.9	58.9	44.3
04:00 AM - 05:00 AM	46.5	64.5	42.7
05:00 AM - 06:00 AM	46.0	59.6	42.8
06:00 AM - 07:00 AM	45.1	61.8	42.9
07:00 AM - 08:00 AM	46.9	70.0	45.1
08:00 AM - 09:00 AM	52.5	70.4	46.0
09:00 AM - 10:00 AM	60.5	70.4	44.4

Leq Average 24 hrs. (dB(A))	55.4
Lmax (dB(A))	79.9
L90 (dB(A))	44.3
Ldn (dB(A))	
Standard (dB(A))	115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งปี 15 (พ.ศ. 2540) ค่ากำหนดมาตรฐานเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งปี 15 (พ.ศ. 2540) ค่ากำหนดมาตรฐานเสียงโดยทั่วไป
โดย พ.ร.บ. 2548

Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
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Approved by

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Section Head

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TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114626-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number : 2499753-11

Parameter : Noise (Leq 24 hrs.)

Location : บ้านนาบัว (N2) (GPS 47P 0751159, 1425557)

Measurement Date : Sep 10 - Sep 11, 2024

Measurement by : Panuwat Wanghong

Sound Level meter : Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	62.6	73.4	43.9
01:00 PM - 02:00 PM	60.5	70.4	44.4
02:00 PM - 03:00 PM	53.2	69.9	44.3
03:00 PM - 04:00 PM	50.4	64.8	47.6
04:00 PM - 05:00 PM	51.7	65.1	47.6
05:00 PM - 06:00 PM	54.2	67.5	45.0
06:00 PM - 07:00 PM	48.2	65.9	44.6
07:00 PM - 08:00 PM	46.3	63.9	44.2
08:00 PM - 09:00 PM	47.0	59.2	44.1
09:00 PM - 10:00 PM	46.4	61.3	44.4
10:00 PM - 11:00 PM	46.2	61.3	44.3
11:00 PM - 12:00 AM	46.5	59.5	44.4
12:00 AM - 01:00 AM	45.1	57.1	42.4
01:00 AM - 02:00 AM	47.2	67.1	44.5
02:00 AM - 03:00 AM	46.5	60.7	44.5
03:00 AM - 04:00 AM	46.2	60.1	44.2
04:00 AM - 05:00 AM	44.5	60.3	41.9
05:00 AM - 06:00 AM	45.9	66.3	40.7
06:00 AM - 07:00 AM	45.0	65.8	39.1
07:00 AM - 08:00 AM	48.4	67.7	42.2
08:00 AM - 09:00 AM	60.5	70.4	44.4
09:00 AM - 10:00 AM	52.1	61.7	50.9
10:00 AM - 11:00 AM	50.9	60.7	49.2
11:00 AM - 12:00 PM	48.7	60.5	46.0
Leq Average 24 hrs. (dB(A))	53.8		
Lmax (dB(A))	73.4		44.4
L90 (dB(A))			
Ldn (dB(A))	55.7		
Standard (dB(A))	70		115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป
โดย พ.ร.บ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

Life Sciences

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S:\Reports_Air Noise pr (4.60PM)



TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114627-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number : 2499753-12

Parameter : Noise (Leq 24 hrs.)

Location : บ้านนาบัว (N2) (GPS 47P 0751159, 1425557)

Measurement Date : Sep 11 - Sep 12, 2024

Measurement by : Panuwat Wanghong

Sound Level meter : Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	63.9	77.1	48.7
01:00 PM - 02:00 PM	63.0	76.2	47.8
02:00 PM - 03:00 PM	51.1	67.7	46.2
03:00 PM - 04:00 PM	49.7	71.0	46.3
04:00 PM - 05:00 PM	49.1	67.6	45.6
05:00 PM - 06:00 PM	49.0	68.8	45.3
06:00 PM - 07:00 PM	48.2	69.8	44.4
07:00 PM - 08:00 PM	47.1	67.9	44.4
08:00 PM - 09:00 PM	47.1	61.0	44.1
09:00 PM - 10:00 PM	50.6	70.1	43.4
10:00 PM - 11:00 PM	51.3	73.6	42.4
11:00 PM - 12:00 AM	44.6	65.9	41.9
12:00 AM - 01:00 AM	45.5	69.8	42.4
01:00 AM - 02:00 AM	44.9	66.8	43.2
02:00 AM - 03:00 AM	45.7	62.7	43.7
03:00 AM - 04:00 AM	46.7	74.2	44.3
04:00 AM - 05:00 AM	50.6	73.0	46.0
05:00 AM - 06:00 AM	49.4	71.8	44.8
06:00 AM - 07:00 AM	49.7	72.1	45.1
07:00 AM - 08:00 AM	50.0	66.6	45.0
08:00 AM - 09:00 AM	49.4	68.7	44.5
09:00 AM - 10:00 AM	49.6	66.2	44.9
10:00 AM - 11:00 AM	48.3	66.8	43.7
11:00 AM - 12:00 PM	52.3	82.1	44.6
Leq Average 24 hrs. (dB(A))	54.2		
Lmax (dB(A))	82.1		44.5
L90 (dB(A))			
Ldn (dB(A))	56.9		
Standard (dB(A))	70		115

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) ซึ่งกำหนดมาตรฐานระดับเสียงโดยทั่วไป
โดย พ.ร.บ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameh
Section Head

Life Sciences

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S:\Reports_Air Noise pr (4.56PM)



TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114628-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number 2499753-13

Parameter Noise (Leq 24 hrs.)
Location บ้านนาบัว (N2) (GPS 47P 0751159, 1425557)
Measurement Date Sep 12 - Sep 13, 2024
Measurement by Panuwat Wangdong
Sound Level meter Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	68.5	83.8	52.6
01:00 PM - 02:00 PM	56.4	75.0	53.3
02:00 PM - 03:00 PM	54.6	82.1	49.5
03:00 PM - 04:00 PM	51.3	81.7	47.6
04:00 PM - 05:00 PM	54.1	80.6	46.1
05:00 PM - 06:00 PM	69.6	97.7	45.4
06:00 PM - 07:00 PM	66.3	71.8	43.7
07:00 PM - 08:00 PM	45.2	57.5	43.8
08:00 PM - 09:00 PM	44.6	58.0	43.3
09:00 PM - 10:00 PM	43.7	58.9	42.6
10:00 PM - 11:00 PM	42.7	52.6	41.7
11:00 PM - 12:00 AM	42.6	50.8	41.7
12:00 AM - 01:00 AM	43.0	60.4	41.9
01:00 AM - 02:00 AM	43.4	61.1	42.4
02:00 AM - 03:00 AM	44.0	59.5	43.2
03:00 AM - 04:00 AM	47.0	67.6	43.2
04:00 AM - 05:00 AM	68.7	96.9	44.2
05:00 AM - 06:00 AM	47.8	72.4	43.7
06:00 AM - 07:00 AM	49.0	74.8	44.9
07:00 AM - 08:00 AM	48.8	69.6	44.6
08:00 AM - 09:00 AM	47.2	63.7	43.4
09:00 AM - 10:00 AM	49.4	68.5	43.1
10:00 AM - 11:00 AM	48.0	72.6	40.9
11:00 AM - 12:00 PM	49.4	64.9	44.9
Leq Average 24 hrs. (dB(A))	60.3		
Lmax (dB(A))	97.7		43.7
L90 (dB(A))			
Ldn (dB(A))	66.0		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งปี 15 (พ.ศ. 2540) ค่ากำหนดมาตรฐานเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งปี 15 (พ.ศ. 2540) ค่ากำหนดมาตรฐานเสียงโดยทั่วไป
โดย พ.ร.บ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Supt S.

Approved by
Supot Salameh
Section Head

Chontichak

Chonticha Subongkroh
Scientist (3)

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Approved by

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S/Report_Air Noise pr (4.6/PM)



TESTING
No.0042

Lot ID: 2499753

Date Received : Sep 16, 2024
Date Reported : Sep 18, 2024
Report Number: 3114629-1

Page 1 of 1



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O :
Project Name :
Project Location :

Sample Number 2499753-14

Parameter Noise (Leq 24 hrs.)
Location บ้านนาบัว (N2) (GPS 47P 0751159, 1425557)
Measurement Date Sep 13 - Sep 14, 2024
Measurement by Panuwat Wangdong
Sound Level meter Serial No. 233184

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	51.6	82.0	45.7
01:00 PM - 02:00 PM	48.4	69.3	44.9
02:00 PM - 03:00 PM	47.9	70.8	44.2
03:00 PM - 04:00 PM	52.1	84.4	45.4
04:00 PM - 05:00 PM	53.6	79.8	46.0
05:00 PM - 06:00 PM	69.8	97.4	45.2
06:00 PM - 07:00 PM	45.8	65.3	44.1
07:00 PM - 08:00 PM	45.2	56.8	44.0
08:00 PM - 09:00 PM	45.8	59.5	43.4
09:00 PM - 10:00 PM	44.3	66.5	42.2
10:00 PM - 11:00 PM	44.1	59.8	42.2
11:00 PM - 12:00 AM	43.4	57.8	42.1
12:00 AM - 01:00 AM	42.8	49.4	42.0
01:00 AM - 02:00 AM	42.5	55.4	41.5
02:00 AM - 03:00 AM	66.3	83.7	41.8
03:00 AM - 04:00 AM	67.2	75.0	51.4
04:00 AM - 05:00 AM	69.9	97.3	54.9
05:00 AM - 06:00 AM	47.4	72.1	44.8
06:00 AM - 07:00 AM	51.1	72.6	45.6
07:00 AM - 08:00 AM	51.1	74.4	45.0
08:00 AM - 09:00 AM	51.9	80.0	43.4
09:00 AM - 10:00 AM	52.5	67.3	41.6
10:00 AM - 11:00 AM	49.6	60.6	45.2
11:00 AM - 12:00 PM	50.3	61.5	45.1
Leq Average 24 hrs. (dB(A))	61.4		
Lmax (dB(A))	97.4		44.2
L90 (dB(A))			
Ldn (dB(A))	69.8		
Standard (dB(A))	70	115	

Reference Method : ISO1996-1 and 1996-2
Standard : 1. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งปี 15 (พ.ศ. 2540) ค่ากำหนดมาตรฐานเสียงโดยทั่วไป
2. กรมควบคุมมลพิษและสิ่งแวดล้อม แห่งปี 15 (พ.ศ. 2540) ค่ากำหนดมาตรฐานเสียงโดยทั่วไป
โดย พ.ร.บ. 2548
Remark : The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

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ภาคผนวก ค-4

ระดับเสียงในบริเวณการทำงาน



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nonggoua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2491851
Date Received : Aug 28, 2024
Date Reported : Aug 30, 2024
Report Number: 3097487-1

Page 1 of 1

Sample Number	2491851-2
Parameter	Noise (Leq 8 hrs.)
Location	Steam Turbine (Out)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salameh
Time	
10:22 AM - 11:22 AM	74.7
11:22 AM - 12:22 PM	74.8
12:22 PM - 01:22 PM	75.0
01:22 PM - 02:22 PM	75.0
02:22 PM - 03:22 PM	75.0
03:22 PM - 04:22 PM	75.1
04:22 PM - 05:22 PM	74.8
05:22 PM - 06:22 PM	74.8
Leq Average 8 hrs. (dB(A))	74.9
Lmax (dB(A))	85.2
Standard (dB(A))	90
Reference Method : ISO1996-1 and 1996-2	
Standard : มาตรฐานการวัดและประเมินผลเสียง ตามข้อกำหนดการปฏิบัติงาน/คู่มือการประเมินผลในโรงงาน พ.ศ.๒๕๖๖	

Leq Average 8 hrs. (dB(A)) 74.9

Lmax (dB(A)) 85.2

Standard (dB(A)) 90

Reference Method : ISO1996-1 and 1996-2

Standard : มาตรฐานการวัดและประเมินผลเสียง
ตามข้อกำหนดการปฏิบัติงาน/คู่มือการประเมินผลในโรงงาน พ.ศ.๒๕๖๖

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supot Salameh

Section Head

Life Sciences

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2721-41/ EMAIL

SVReport_Air Noise.pdf (1.66PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nonggoua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2491851
Date Received : Aug 28, 2024
Date Reported : Aug 30, 2024
Report Number: 3097488-1

Page 1 of 1

Sample Number	2491851-3
Parameter	Noise (Leq 8 hrs.)
Location	Force Draft Fan
Measurement Date	Aug 27, 2024
Measurement by	Supot Salameh
Time	
10:19 AM - 11:19 AM	84.1
11:19 AM - 12:19 PM	84.1
12:19 PM - 01:19 PM	84.1
01:19 PM - 02:19 PM	84.2
02:19 PM - 03:19 PM	84.2
03:19 PM - 04:19 PM	84.2
04:19 PM - 05:19 PM	84.2
05:19 PM - 06:19 PM	84.2
Leq Average 8 hrs. (dB(A))	84.2
Lmax (dB(A))	85.7
Standard (dB(A))	90
Reference Method : ISO1996-1 and 1996-2	
Standard : มาตรฐานการวัดและประเมินผลเสียง ตามข้อกำหนดการปฏิบัติงาน/คู่มือการประเมินผลในโรงงาน พ.ศ.๒๕๖๖	

Leq Average 8 hrs. (dB(A)) 84.2

Lmax (dB(A)) 85.7

Standard (dB(A)) 90

Reference Method : ISO1996-1 and 1996-2

Standard : มาตรฐานการวัดและประเมินผลเสียง
ตามข้อกำหนดการปฏิบัติงาน/คู่มือการประเมินผลในโรงงาน พ.ศ.๒๕๖๖

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Section Head

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SVReport_Air Noise.pdf (1.66PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2491851
Date Received : Aug 28, 2024
Date Reported : Aug 30, 2024
Report Number: 3097490-1

Page 1 of 1

Sample Number	2491851-5
Parameter	Noise (Leq 8 hrs.)
Location	Boost up Fan (Oxidation Air Blower) Out
Measurement Date	Aug 27, 2024
Measurement by	Supot Salameh
Time	
10:10 AM - 11:10 AM	80.5
11:10 AM - 12:10 PM	80.8
12:10 PM - 01:10 PM	80.4
01:10 PM - 02:10 PM	80.1
02:10 PM - 03:10 PM	79.8
03:10 PM - 04:10 PM	79.7
04:10 PM - 05:10 PM	80.1
05:10 PM - 06:10 PM	80.4
Leq Average 8 hrs. (dB(A))	80.2
Lmax (dB(A))	86.3
Standard (dB(A))	90
Reference Method : ISO1996-1 and 1996-2	
Standard : มาตรฐานการวัดและประเมินผลเสียงจากการทำงานของเครื่องจักรกลในโรงงานอุตสาหกรรม ตามข้อกำหนดการวัดและประเมินผลเสียงจากการทำงานของเครื่องจักรกลในโรงงานอุตสาหกรรม พ.ศ. ๒๕๕๖	

Technical Management

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Chonticha Subongkroh
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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 24139548
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3201810-1

Page 1 of 1

Sample Number	24139548-2
Parameter	Noise (Leq 8 hrs.)
Location	Steam Turbine (Out)
Measurement Date	Dec 20, 2024
Measurement by	Nattakarn Vornginyoo
Time	
08:36 AM - 09:36 AM	77.0
09:36 AM - 10:36 AM	77.1
10:36 AM - 11:36 AM	77.3
11:36 AM - 12:36 PM	76.8
12:36 PM - 01:36 PM	76.7
01:36 PM - 02:36 PM	76.7
02:36 PM - 03:36 PM	77.0
03:36 PM - 04:36 PM	77.4
Leq Average 8 hrs. (dB(A))	77.0
Lmax (dB(A))	85.6
Standard (dB(A))	90
Reference Method : ISO1996-1 and 1996-2	
Standard : มาตรฐานการวัดและประเมินผลเสียงจากการทำงานของเครื่องจักรกลในโรงงานอุตสาหกรรม ตามข้อกำหนดการวัดและประเมินผลเสียงจากการทำงานของเครื่องจักรกลในโรงงานอุตสาหกรรม พ.ศ. ๒๕๕๖	

Technical Management

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S:\Reports_Air Noise\pt (6:00PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :
Lot ID: 24139548
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3201811-1

Page 1 of 1

Sample Number	24139548-3
Parameter	Noise (Leq 8 hrs.)
Location	Force Draft Fan
Measurement Date	Dec 20, 2024
Measurement by	Nattakarn Vornginyoo
Time	
	08:12 AM - 09:12 AM
	09:12 AM - 10:12 AM
	10:12 AM - 11:12 AM
	11:12 AM - 12:12 PM
	12:12 PM - 01:12 PM
	01:12 PM - 02:12 PM
	02:12 PM - 03:12 PM
	03:12 PM - 04:12 PM
Leq Average 8 hrs. (dB(A))	83.9
Lmax (dB(A))	85.5
Standard (dB(A))	90
Reference Method	: ISO1996-1 and 1996-2
Standard	: มาตรฐานการวัดเสียงรบกวน (เสียง) ภาคการควบคุมการรบกวน ตามประกาศกระทรวงสาธารณสุข (ฉบับที่ 16) พ.ศ. 2556

L90 (dB(A))	84.6
Lmax (dB(A))	85.1
L90 (dB(A))	84.2
Lmax (dB(A))	85.0
L90 (dB(A))	83.8
Lmax (dB(A))	84.7
L90 (dB(A))	83.8
Lmax (dB(A))	84.3
L90 (dB(A))	83.8
Lmax (dB(A))	84.8
L90 (dB(A))	83.7
Lmax (dB(A))	85.5
L90 (dB(A))	83.7
Lmax (dB(A))	84.3

L90 (dB(A))	84.6
Lmax (dB(A))	85.1
L90 (dB(A))	84.2
Lmax (dB(A))	85.0
L90 (dB(A))	83.8
Lmax (dB(A))	84.7
L90 (dB(A))	83.8
Lmax (dB(A))	84.3
L90 (dB(A))	83.8
Lmax (dB(A))	84.8
L90 (dB(A))	83.7
Lmax (dB(A))	85.5
L90 (dB(A))	83.7
Lmax (dB(A))	84.3

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameeh
Section Head

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S:\Reports_Air Noise.pdf (6.00PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :
Lot ID: 24139548
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3201813-1

Page 1 of 1

Sample Number	24139548-5
Parameter	Noise (Leq 8 hrs.)
Location	Boost up Fan (Oxidation Air Blower) Out
Measurement Date	Dec 19, 2024
Measurement by	Nattakarn Vornginyoo
Time	
	09:03 AM - 10:03 AM
	10:03 AM - 11:03 AM
	11:03 AM - 12:03 PM
	12:03 PM - 01:03 PM
	01:03 PM - 02:03 PM
	02:03 PM - 03:03 PM
	03:03 PM - 04:03 PM
	04:03 PM - 05:03 PM
Leq Average 8 hrs. (dB(A))	78.0
Lmax (dB(A))	84.2
Standard (dB(A))	90
Reference Method	: ISO1996-1 and 1996-2
Standard	: มาตรฐานการวัดเสียงรบกวน (เสียง) ภาคการควบคุมการรบกวน ตามประกาศกระทรวงสาธารณสุข (ฉบับที่ 16) พ.ศ. 2556

L90 (dB(A))	78.0
Lmax (dB(A))	84.2
L90 (dB(A))	77.8
Lmax (dB(A))	82.9
L90 (dB(A))	77.5
Lmax (dB(A))	83.4
L90 (dB(A))	78.0
Lmax (dB(A))	83.6
L90 (dB(A))	77.6
Lmax (dB(A))	83.3
L90 (dB(A))	77.7
Lmax (dB(A))	83.3
L90 (dB(A))	77.6
Lmax (dB(A))	82.2
L90 (dB(A))	76.8

L90 (dB(A))	78.0
Lmax (dB(A))	84.2
L90 (dB(A))	77.8
Lmax (dB(A))	82.9
L90 (dB(A))	77.5
Lmax (dB(A))	83.4
L90 (dB(A))	78.0
Lmax (dB(A))	83.6
L90 (dB(A))	77.6
Lmax (dB(A))	83.3
L90 (dB(A))	77.7
Lmax (dB(A))	83.3
L90 (dB(A))	77.6
Lmax (dB(A))	82.2
L90 (dB(A))	76.8

Technical Management

Chontichak

Chonticha Subongkroh
Scientist (3)

Approved by

Supt S.

Supot Salameeh
Section Head

Life Sciences

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2721-41/ EMail

S:\Reports_Air Noise.pdf (6:07PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2488924
Date Received : Dec 25, 2024
Date Reported : Jan 02, 2025
Report Number: 3206210-1

Page 1 of 1

Sample Number	2488924-2
Parameter	Noise (Leq 8 hrs.)
Location	Steam Turbine (Out)
Measurement Date	Dec 24, 2024
Measurement by	Nattakarn Vornginyoo
Time	
09:00 AM - 10:00 AM	76.1
10:00 AM - 11:00 AM	82.0
11:00 AM - 12:00 PM	81.2
12:00 PM - 01:00 PM	80.9
01:00 PM - 02:00 PM	80.5
02:00 PM - 03:00 PM	85.7
03:00 PM - 04:00 PM	84.8
04:00 PM - 05:00 PM	80.3
Leq Average 8 hrs. (dB(A))	76.2
Lmax (dB(A))	85.7
Standard (dB(A))	90
Reference Method : ISO1996-1 and 1996-2	
Standard : ใช้นาฬิกาจับเวลาพร้อมเครื่องวัดเสียง และทำการสุ่มค่าเสียงตามเวลาที่กำหนด	
บันทึกผลการสุ่มค่าเสียงตามเวลาที่กำหนดและค่าเฉลี่ยในตารางหน้า	

Technical Management

Thanitak.

Thanita Kulsriwong
Scientist (4)

Approved by

Supt S.

Supot Salameh
Section Head

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2721-41/ EMail

S:\Report\Air Noise\pt(10-40AM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2488924
Date Received : Dec 25, 2024
Date Reported : Jan 02, 2025
Report Number: 3206211-1

Page 1 of 1

Sample Number	2488924-3
Parameter	Noise (Leq 8 hrs.)
Location	Force Draft Fan
Measurement Date	Dec 24, 2024
Measurement by	Nattakarn Vornginyoo
Time	
09:00 AM - 10:00 AM	83.9
10:00 AM - 11:00 AM	83.7
11:00 AM - 12:00 PM	84.2
12:00 PM - 01:00 PM	85.0
01:00 PM - 02:00 PM	84.4
02:00 PM - 03:00 PM	84.0
03:00 PM - 04:00 PM	93.2
04:00 PM - 05:00 PM	84.1
Leq Average 8 hrs. (dB(A))	83.6
Lmax (dB(A))	93.2
Standard (dB(A))	90
Reference Method : ISO1996-1 and 1996-2	
Standard : ใช้นาฬิกาจับเวลาพร้อมเครื่องวัดเสียง และทำการสุ่มค่าเสียงตามเวลาที่กำหนด	
บันทึกผลการสุ่มค่าเสียงตามเวลาที่กำหนดและค่าเฉลี่ยในตารางหน้า	

Technical Management

Thanitak.

Thanita Kulsriwong
Scientist (4)

Approved by

Supt S.

Supot Salameh
Section Head

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S:\Report\Air Noise\pt(10-40AM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 480043002
Project Name :
Project Location :

Lot ID: 2488924
Date Received : Dec 25, 2024
Date Reported : Jan 02, 2025
Report Number: 3206213-1

Page 1 of 1

Sample Number	2488924-5
Parameter	Noise (Leq 8 hrs.)
Location	Boost up Fan (Oxidation Air Blower) Out
Measurement Date	Dec 24, 2024
Measurement by	Nattakam Vorghyoo
Time	Leq (dB(A))Lmax (dB(A))L90 (dB(A))
09:00 AM - 10:00 AM	82.2100.577.9
10:00 AM - 11:00 AM	79.897.477.6
11:00 AM - 12:00 PM	77.786.877.4
12:00 PM - 01:00 PM	77.786.977.3
01:00 PM - 02:00 PM	77.881.877.4
02:00 PM - 03:00 PM	77.779.177.4
03:00 PM - 04:00 PM	77.780.977.4
04:00 PM - 05:00 PM	77.882.677.4
Leq Average 8 hrs. (dB(A))	78.9
Lmax (dB(A))	100.5
Standard (dB(A))	140

Reference Method : ISO1996-1 and 1996-2
Standard : ประกาศกระทรวงอุตสาหกรรม เรื่อง มาตรฐานการควบคุมการปล่อยเสียงจากเครื่องจักรกลและเครื่องมือกลที่ใช้ในโรงงานอุตสาหกรรม พ.ศ. ๒๕๔๐
Turntable Calibration Laboratory (TCL) Co., Ltd. An ALS Limited Company

Technical Management
Thantak.
Thanita Kulsurwong
Scientist (4)

Approved by
Supt S.
Supot Salamtah
Section Head

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ภาคผนวก ค-5

คุณภาพน้ำทิ้งจากบ่อดักไขมัน (Inspection Manhole)



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O :
Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานน้ำตาล)
Project Location : Factory

Page 1 of 2

Sample Number : 2467744-1
Sample Date : Jul 01, 2024 2:17 PM
Sample Description : Wastewater
Location : น้ำทิ้งจากกระบวนการผลิต (น้ำทิ้งจาก) วัสดุ : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced : Jul 01, 2024
Condition of Sample : Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / US EPA)

Analyte	Unit	LOD	LOQ (LOQ)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2.0	<2.0	≤500	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	<25	≤750	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Rayong
pH at 25 degree C		-	-	7.5	5.5-9.0	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	32.5	≤40	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	812	≤3000	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	2.6	≤100	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 4500-Norg (C), part NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	17	≤200	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Standard of Rojana Industrial park (Rayong). Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Phongthep Sitthibhoh รหัสผู้ตรวจ 3-323-0-0023 , Nachakorn Haisa รหัสผู้ตรวจ 3-204-0-0187

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management

Chontichok
Chonticha Subongkoch
Scientist (3)
รหัสผู้ตรวจ 3-323-0-9449

Approved by

D. Chuan
Dej Changchon
Senior Manager
รหัสผู้ตรวจ 3-323-0-9442

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

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Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O :
Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานน้ำตาล)
Project Location : Factory

Page 2 of 2

- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Chontichok
Chonticha Subongkoch
Scientist (3)
รหัสผู้ตรวจ 3-323-0-9449

Approved by

D. Chuan
Dej Changchon
Senior Manager
รหัสผู้ตรวจ 3-323-0-9442

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Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O :

Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสียโรงงาน (โรงงานน้ำตาล)

Project Location : Factory

Lot ID: 2467744
Date Received : Jul 01, 2024
Date Reported : Jul 06, 2024
Report Number : 3024826-2

Page 1 of 1

Sample Number 2467744-1
Sample Date Jul 01, 2024 2:17 PM
Sample Description Wastewater
Location น้ำทิ้งจากกระบวนการผลิต (บริเวณอาคาร) จาก : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced Jul 02, 2024
Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 5520 D	Bangkok

Guideline : Standard of Rojana Industrial park (Rayong). Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Phongthep Sithiloh วิสิตินันท์ 3-323-4-0023, Nachakorn Haisa วิสิตินันท์ 3-204-4-0187

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management
Suwimon Chaiwangwut
Scientist (3)
วิสิตินันท์ 3-204-4-0018

Approved by
Kanklorn Anek
Assistant General Manager
วิสิตินันท์ 3-204-4-0004

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S (Report)_AL_G (pt) (1045M)



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O :

Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสียโรงงาน (โรงงานน้ำตาล)

Project Location : Factory

TESTING
No.0042
Lot ID: 2486613
Date Received : Aug 01, 2024
Date Reported : Aug 08, 2024
Report Number : 3068019-1

Page 1 of 2

Sample Number 2486613-1
Sample Date Aug 01, 2024 11:53 AM
Sample Description Wastewater
Location น้ำทิ้งจากกระบวนการผลิต (บริเวณอาคาร) จาก : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced Aug 01, 2024
Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing BOD (5 days at 20 Degree C)	mg/L	-	2.0	<2.0	≤500	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	<25	≤750	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Rayong
pH at 25 degree C	-	-	-	7.4	5.5-9.0	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	31.3	≤40	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2530 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	736	≤3000	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	2.1	≤100	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 4500-Norg (C), part NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	23	≤200	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Standard of Rojana Industrial park (Rayong). Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Phongthep Sithiloh วิสิตินันท์ 3-323-4-0023, Samart Khumplee วิสิตินันท์ 3-204-4-0084

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management
Photchanas.
Photchanas Seeda
Scientist (4)
วิสิตินันท์ 3-323-4-9446

Approved by
Dej Changchon
Senior Manager
วิสิตินันท์ 3-323-4-9442

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S (Report)_AL_G (pt) (231PM)



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310
P/O :
Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานผ้าไหม)
Project Location : Factory

TESTING
No.0042
Lot ID: 2486613
Date Received : Aug 01, 2024
Date Reported : Aug 08, 2024
Report Number : 3068019-1

- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Page 2 of 2



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310
P/O :
Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานผ้าไหม)
Project Location : Factory

Lot ID: 2486613
Date Received : Aug 01, 2024
Date Reported : Aug 07, 2024
Report Number : 3068019-2

Page 1 of 1

Sample Number	2486613-1						
Sample Date	Aug 01, 2024 11:53 AM						
Sample Description	Wastewater						
Location	น้ำทิ้ง บริเวณโถง คาร์บอน แคลด์ (บริเวณทอผ้า) จาก : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.						
Date Analysis Commenced	Aug 02, 2024						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 55.20 D	Bangkok

Guideline : Standard of Rojana Industrial park (Rayong), Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Phongshep Sithichol วิจัยงานเลขที่ 7-323-4-0023 , Samart Khumphlee วิจัยงานเลขที่ 7-204-4-0084

Remark :
- LOD : Limit of Detection
- LOR : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management

Photchana S.
Photchana Seeda
Scientist (4)

วิจัยงานเลขที่ 7-323-4-9446

Approved by

D. Changchon
Dej Changchon
Senior Manager

วิจัยงานเลขที่ 7-323-4-9442

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Swimon C.
Suwimon Chaiwangwut
Scientist (3)

วิจัยงานเลขที่ 7-204-4-0018

Approved by

Kankom Anuk.
Kankom Anuk
Assistant General Manager

วิจัยงานเลขที่ 7-204-4-0004

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S:\Report\AL_Grp (513PM)



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

TESTING
No.0042
Lot ID: 2498356
Date Received : Sep 02, 2024
Date Reported : Sep 09, 2024
Report Number : 3092751-1

P/O :
Project Name : โครงการชลประทานการอุตสาหกรรม โรงงาน (โรงงานน้ำแดง)
Project Location : Factory

Page 1 of 2

Sample Number 2498356-1
Sample Date Sep 02, 2024 2:04 PM
Sample Description Wastewater
Location แหล่งน้ำดิบดิบ คาร์บอน แคลด์ (บริเวณฟาร์ม) ไร่/ค : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced Sep 02, 2024
Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USBPA)

Analyte	Unit	LOD	LOQ (LOQ)	Result	Guideline / Specification	Method	Testing Location
Water Testing BOD (5 days at 20 Degree C)	mg/L	-	2.0	<2.0	≤500	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	<25	≤750	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 5220 D	Rayong
pH at 25 degree C		-	-	7.5	5.5-9.0	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	26.9	≤40	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	376	≤3000	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	1.1	≤100	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 4500-Norg (C), part NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	9	≤200	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D	Rayong

Guideline : Standard of Rojana Industrial park (Rayong). Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Phongthep Sitthibhoh รหัสต้นน้ำ 323-3-0023 , Smart Khumplee รหัสต้นน้ำ 323-3-0084

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management

Photchanas.S.

Photchanas Seeda
Scientist (4)
รหัสต้นน้ำ 323-3-0028

Approved by

Dej Changchon

Senior Manager
รหัสต้นน้ำ 323-3-0001

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1406-S3/BMAL

S:Report_ML_Grpt (1:499H)



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

TESTING
No.0042
Lot ID: 2498356
Date Received : Sep 02, 2024
Date Reported : Sep 09, 2024
Report Number : 3092751-1

P/O :
Project Name : โครงการชลประทานการอุตสาหกรรม โรงงาน (โรงงานน้ำแดง)
Project Location : Factory

- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Photchanas.S.

Photchanas Seeda
Scientist (4)
รหัสต้นน้ำ 323-3-0028

Approved by

Dej Changchon

Senior Manager
รหัสต้นน้ำ 323-3-0001

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S:Report_ML_Grpt (1:499H)



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานน้ำ)

Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานน้ำ)

Project Location : Factory

Lot ID: 2498356
Date Received : Sep 02, 2024
Date Reported : Sep 09, 2024
Report Number : 3092751-2

Page 1 of 1

Sample Number 2498356-1
Sample Date Sep 02, 2024 2:04 PM
Sample Description Wastewater
Location บริษัท บริดจสโตน คาร์บอน แบล็ค (ประเทศไทย) จำกัด : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced Sep 03, 2024
Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 23rd ed., 2017, part 5520 D	Bangkok

Guideline : Standard of Rojana Industrial park (Rayong). Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Phongthep Siththichol วิสณูณพงศ์ 3-323-4-0023 , Samart Khumplinee วิสณูณพงศ์ 3-204-4-0084

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management
Siriuk P.
Siriuk Bunrak
Section Head
วิสณูณพงศ์ 3-204-4-0013

Approved by
Kankom Anek
Kankom Anek
Assistant General Manager
วิสณูณพงศ์ 3-204-4-0004

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1406-S3 BML

S:\Report\AL_Grpt (0012M)



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานน้ำ)

Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานน้ำ)

Project Location : Factory

TESTING
No.0042
Lot ID: 24109515
Date Received : Oct 03, 2024
Date Reported : Oct 10, 2024
Report Number : 3118323-1

Page 1 of 2

Sample Number 24109515-1
Sample Date Oct 03, 2024 11:00 AM
Sample Description Wastewater
Location บริษัท บริดจสโตน คาร์บอน แบล็ค (ประเทศไทย) จำกัด : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced Oct 03, 2024
Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing BOD (5 days at 20 Degree C)	mg/L	-	2.0	<2.0	≤500	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	<25	≤750	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
pH at 25 degree C	-	-	-	7.1	5.5-9.0	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 4510 - H (B)	Rayong
Temperature *	Degree C	-	-	33.5	≤40	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	1710	≤3000	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	4.7	≤100	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 4500-Norg (C), part NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	10	≤200	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Standard of Rojana Industrial park (Rayong). Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Suphanat Sakulk วิสณูณพงศ์ 3-323-4-0021 , Samart Khumplinee วิสณูณพงศ์ 3-204-4-0084

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management
Photchanas.
Photchanas Seeda
Scientist (4)
วิสณูณพงศ์ 3-323-4-0028

Approved by
Dej Changchon
Senior Manager
วิสณูณพงศ์ 3-323-4-0001

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S:\Report\Water\AL_Grpt (2309H)



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O :
Project Name : โครงการพัฒนาระบบการทดสอบการกรองน้ำของ โรงงาน (โรงงานน้ำดื่ม)
Project Location : Factory

- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Page 2 of 2



TESTING
No.0042

Lot ID: 24109515
Date Received : Oct 03, 2024
Date Reported : Oct 10, 2024
Report Number : 3118323-1



Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O :
Project Name : โครงการพัฒนาระบบการทดสอบการกรองน้ำของ โรงงาน (โรงงานน้ำดื่ม)
Project Location : Factory

Page 1 of 1

Sample Number	24109515-1						
Sample Date	Oct 03, 2024 11:00 AM						
Sample Description	Wastewater						
Location	น้ำทิ้ง บ่อตกตะกอน คาร์บอน แคลด์ (บ่แรกตกตะกอน) จำกัด : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.						
Date Analysis Commenced	Oct 04, 2024						
Condition of Sample	Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)						
Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 5520 D	Bangkok

Guideline : Standard of Rojana Industrial park (Rayong), Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Suphanat Sakulk วิสดูณทรัพย์ 323-ก-0021 , Samart Khumphilee วิสดูณทรัพย์ 320-ก-0084

Remark :

- LOD : Limit of Detection
- LOR : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management

Photchana S.
Photchana Seeda
Scientist (4)

วิสดูณทรัพย์ 323-ก-0028

Approved by

D. Changchon
Dej Changchon
Senior Manager

วิสดูณทรัพย์ 323-ก-0001

Technical Management

Narin Salseng
Narin Salseng
Supervisor

วิสดูณทรัพย์ 320-ก-0009

Approved by

Kandkom Anik
Kandkom Anik
Assistant General Manager

วิสดูณทรัพย์ 320-ก-0004

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Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

TESTING
No.0042
Lot ID: 24124398
Date Received : Nov 01, 2024
Date Reported : Nov 08, 2024
Report Number : 3150542-1

P/O :
Project Name : โครงการชลประทานภาคกลางตอนล่าง ระยะที่ 3 (โรงงานน้ำ)
Project Location : Factory

Page 1 of 2

Sample Number	24124398-1
Sample Date	Nov 01, 2024 11:05 AM
Sample Description	Wastewater
Location	พื้นที่บำบัดน้ำเสีย คาร์บอน แคลด์ (บริเวณท่อ) รางที่ : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced	Nov 01, 2024
Condition of Sample	Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USBPA)

Analyte	Unit	LOD	LOQ (LOQ)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2.0	34.9	≤500	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	80	≤750	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
pH at 25 degree C		-	-	7.5	5.5-9.0	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	32.0	≤40	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	516	≤3000	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	21.5	≤100	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 4500-Norg (C), part NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	26	≤200	Standard Methods for the Examination of Water and Wastewater: APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Standard of Rojana Industrial park (Rayong). Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Phongthep Sitthibhoh วิสตันณพงศ์ 3-323-4-0023 , Pattarapol Sawanglatham วิสตันณพงศ์ 3-204-4-0002

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management

Photchanh S.

Photchanh Seeda
Scientist (4)
วิสตันณพงศ์ 3-323-4-0028

Approved by

Dej Changchon

Senior Manager
วิสตันณพงศ์ 3-323-4-0001

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Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

TESTING
No.0042
Lot ID: 24124398
Date Received : Nov 01, 2024
Date Reported : Nov 08, 2024
Report Number : 3150542-1

P/O :
Project Name : โครงการชลประทานภาคกลางตอนล่าง ระยะที่ 3 (โรงงานน้ำ)
Project Location : Factory

- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Photchanh S.

Photchanh Seeda
Scientist (4)
วิสตันณพงศ์ 3-323-4-0028

Approved by

Dej Changchon

Senior Manager
วิสตันณพงศ์ 3-323-4-0001

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Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O : โครงการพัฒนาระบบการบำบัดน้ำเสียโรงงาน (โรงงานน้ำดื่ม)

Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสียโรงงาน (โรงงานน้ำดื่ม)

Project Location : Factory

Lot ID: 24124398
Date Received : Nov 01, 2024
Date Reported : Nov 06, 2024
Report Number : 3150542-2

Page 1 of 1

Sample Number 24124398-1
Sample Date Nov 01, 2024 11:05 AM
Sample Description Wastewater
Location น้ำทิ้งจากกระบวนการผลิต (บริเวณห้องผลิต) จ.ลพบุรี : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced Nov 02, 2024
Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing Oil & Grease	mg/L	-	3	4	≤10	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 5520 D	Bangkok

Guideline : Standard of Rojana Industrial park (Rayong), Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)
Sampling By : Phongthep Sithihon วิสณณูเกศย์ 3-323-4-0023 , Pattarapol Sawanglaim วิสณณูเกศย์ 3-204-4-0002

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management
Narin Saeang
Supervisor
วิสณณูเกศย์ 3-204-4-0009

Approved by
Kankom Anek
Assistant General Manager
วิสณณูเกศย์ 3-204-4-0004

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Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O : โครงการพัฒนาระบบการบำบัดน้ำเสียโรงงาน (โรงงานน้ำดื่ม)

Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสียโรงงาน (โรงงานน้ำดื่ม)

Project Location : Factory

TESTING
No.0042
Lot ID: 24134876
Date Received : Dec 02, 2024
Date Reported : Dec 10, 2024
Report Number : 3177751-1

Page 1 of 2

Sample Number 24134876-1
Sample Date Dec 02, 2024 11:25 AM
Sample Description Wastewater
Location น้ำทิ้งจากกระบวนการผลิต (บริเวณห้องผลิต) จ.ลพบุรี : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.
Date Analysis Commenced Dec 02, 2024
Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing BOD (5 days at 20 Degree C)	mg/L	-	2.0	90.6	≤500	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 5210 B, part 4500 - O G	Rayong
COD	mg/L	1.5	25	161	≤750	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 5220 D	Rayong
pH at 25 degree C	-	-	-	7.7	5.5-9.0	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 4500 - H (B)	Rayong
Temperature *	Degree C	-	-	31.3	≤40	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	388	≤3000	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 2540 C	Rayong
Total Kjeldahl Nitrogen as N	mg/L	-	1.0	51.4	≤100	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 4500-Norg (C), part NH3 (D)	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	5	36	≤200	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 2540 D	Rayong

Guideline : Standard of Rojana Industrial park (Rayong), Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)
Sampling By : Phongthep Sithihon วิสณณูเกศย์ 3-323-4-0023 , Kambundit Kitisupavant วิสณณูเกศย์ 3-204-4-0001

Remark :
- LOD : Limit of Detection
- < : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management
Photchanas.
Photchanas Seeda
Scientist (4)
วิสณณูเกศย์ 3-323-4-0028

Approved by
Dej Changchon
Senior Manager
วิสณณูเกศย์ 3-323-4-0001

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

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Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O :

Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานผ้าไหม)

Project Location : Factory

TESTING
No.0042

Lot ID: 24134876

Date Received : Dec 02, 2024

Date Reported : Dec 10, 2024

Report Number : 3177751-1

Page 2 of 2

- Analyte(s) marked * is/are not included in scope of Accreditation ISO/IEC 17025.
- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Analysis / Test Report

Client : Rojana Industrial Management Co., Ltd.
2034/115 26TH Fl. Italthai Tower, New Petchburi Road, Bangkok, Huaykwang, Bangkok
Thailand 10310

P/O :

Project Name : โครงการพัฒนาระบบการบำบัดน้ำเสีย โรงงาน (โรงงานผ้าไหม)

Project Location : Factory

Sample Number 24134876-1

Sample Date Dec 02, 2024 11:25 AM

Sample Description Wastewater

Location บริษัท บริดจ์สโตน คาร์บอน แบล็ค (ประเทศไทย) จำกัด : BRIDGESTONE CARBON BLACK (THAILAND) CO., LTD.

Date Analysis Commenced Dec 03, 2024

Condition of Sample Contained in one amber glass bottle and three plastic bottles. Sample containers comply to pretreatment - preservation standards (APHA / USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing Oil & Grease	mg/L	-	3	<3	≤10	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 24th ed., 2023, part 5520 D	Bangkok

Guideline : Standard of Rojana Industrial park (Rayong), Criteria of wastewater drainage from the factory to central wastewater treatment plant, dated 1 January, 2018 (B.E.2561)

Sampling By : Phongthep Sithichol วิสสิมูณพงศ์ 3-323-0-0023 , Kambundit Kitisupavant วิสสิมูณพงศ์ 3-204-0-0001

Remark :

- LOD : Limit of Detection
- LOR : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Technical Management

Photchann S.
Pratchana Seeda
Scientist (4)

วิสสิมูณพงศ์ 3-323-0-0028

Approved by

D. Chanchon
Dej Chanchon
Senior Manager

วิสสิมูณพงศ์ 3-323-0-0001

Technical Management

Van S.
Narin Salseng
Supervisor

วิสสิมูณพงศ์ 3-204-0-0009

Approved by

Kankom Anuk.
Kankom Anuk
Assistant General Manager

วิสสิมูณพงศ์ 3-204-0-0004

Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. No part of this report may be reproduced in any form without written consent from the laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

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S:\Report\Water\AL_GL_apr (10531M)

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S:\Report\Water\AL_GL_apr (3359M)

ภาคผนวก ค-6

ระดับความร้อนในบริเวณการทำงาน



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O : 4800043002

Project Name :

Project Location :

Lot ID: 2491319

Date Received : Aug 08, 2024

Date Reported : Aug 15, 2024

Report Number: 3077630-1

Page 1 of 10

Sample Number	2491319-1
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 07, 2024
Measurement by	Nattakarn Vonginyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - เมตร : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Reactor Line 1	120	32.7	29.1	41.2	39.3
Average (WBGT)		32.7			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

Supt S.

Supot Salamtah
Section Head

Approved by

Wichan Choonharat

Wichan Choonharat
Assistant Manager

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SWReport_Air_Heat.pdf (1:10PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O : 4800043002

Project Name :

Project Location :

Lot ID: 2491319

Date Received : Aug 08, 2024

Date Reported : Aug 15, 2024

Report Number: 3077630-1

Page 2 of 10

Sample Number	2491319-2
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Jul 08, 2024
Measurement by	Nattakarn Vonginyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - เมตร : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Reactor Line 2	120	31.6	28.9	37.8	36.9
Average (WBGT)		31.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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SWReport_Air_Heat.pdf (1:10PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O : 4800043002

Project Name :

Project Location :

Lot ID: 2491319

Date Received : Aug 08, 2024

Date Reported : Aug 15, 2024

Report Number: 3077630-1

Page 3 of 10

Sample Number	2491319-3
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 07, 2024
Measurement by	Nattakarn Vornginyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - เมตร : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 3	120	32.1	28.9	39.5	38.0
Average (WBGT)		32.1			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O : 4800043002

Project Name :

Project Location :

Lot ID: 2491319

Date Received : Aug 08, 2024

Date Reported : Aug 15, 2024

Report Number: 3077630-1

Page 4 of 10

Sample Number	2491319-4
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 07, 2024
Measurement by	Nattakarn Vornginyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - เมตร : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 1	120	31.7	28.4	39.3	37.4
Average (WBGT)		31.7			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O : 4800043002

Project Name :

Project Location :

Lot ID: 2491319

Date Received : Aug 08, 2024

Date Reported : Aug 15, 2024

Report Number: 3077630-1

Page 5 of 10

Sample Number	2491319-5
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Jul 08, 2024
Measurement by	Nattakarn Vornginyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - เมตร : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 2	120	31.6	28.9	37.8	36.9
Average (WBGT)		31.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

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S'Waporn Air Head (T: 15PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O : 4800043002

Project Name :

Project Location :

Lot ID: 2491319

Date Received : Aug 08, 2024

Date Reported : Aug 15, 2024

Report Number: 3077630-1

Page 6 of 10

Sample Number	2491319-6
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 07, 2024
Measurement by	Nattakarn Vornginyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - เมตร : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 3	120	32.5	29.0	40.8	39.1
Average (WBGT)		32.5			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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S'Waporn Air Head (T: 15PM)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :
Lot ID: 2491855
Date Received : Aug 28, 2024
Date Reported : Aug 31, 2024
Report Number: 3079079-1

Page 1 of 12

Sample Number	2491855-1
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtih
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - บาท : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Reactor Line 1	120	32.6	29.2	40.4	40.3
Average (WBGT)		32.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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Supot Salamtih
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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 2491855
Date Received : Aug 28, 2024
Date Reported : Aug 31, 2024
Report Number: 3079079-1

Page 2 of 12

Sample Number	2491855-2
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtih
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - บาท : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Reactor Line 2	120	31.3	28.7	37.2	37.1
Average (WBGT)		31.3			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

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P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2491855

Date Received : Aug 28, 2024
Date Reported : Aug 31, 2024
Report Number: 3079079-1

Page 3 of 12

Sample Number	2491855-3
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtih
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - บาท : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 3	120	31.6	28.1	39.7	39.6
Average (WBGT)		31.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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Supot Salamtih
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Wichan Choonharat
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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

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P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2491855

Date Received : Aug 28, 2024
Date Reported : Aug 31, 2024
Report Number: 3079079-1

Page 4 of 12

Sample Number	2491855-4
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtih
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - บาท : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 1	120	32.3	28.9	40.3	40.1
Average (WBGT)		32.3			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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Supot Salamtih
Section Head

Approved by

Wichan Choonharat

Wichan Choonharat
Assistant Manager

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O : 4800043002

Project Name :

Project Location :

Lot ID: 2491855

Date Received : Aug 28, 2024

Date Reported : Aug 31, 2024

Report Number: 3079079-1

Page 5 of 12

Sample Number	2491855-5
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtih
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - บาท : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 2	120	32.3	28.7	40.8	40.7
Average (WBGT)		32.3			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
2. Ministerial Regulation on Prescribing of Standard for Administration and Management of Occupational Safety, Health and Environment in relation to Heat, Light and Noise, B.E.2559

Technical Management

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Section Head

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.

4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120

P/O : 4800043002

Project Name :

Project Location :

Lot ID: 2491855

Date Received : Aug 28, 2024

Date Reported : Aug 31, 2024

Report Number: 3079079-1

Page 6 of 12

Sample Number	2491855-6
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtih
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - บาท : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 3	120	29.8	26.3	37.8	37.6
Average (WBGT)		29.8			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 2491855
Date Received : Aug 28, 2024
Date Reported : Aug 31, 2024
Report Number: 3079079-1

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Sample Number	2491855-10
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtih
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - บาท : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Loading Line 1	120	27.0	24.3	33.3	33.0
Average (WBGT)		27.0			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 2491855
Date Received : Aug 28, 2024
Date Reported : Aug 31, 2024
Report Number: 3079079-1

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Sample Number	2491855-11
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtih
Location	ปฏิบัติงาน 1 ชั่วโมง (ได้-อุณหภูมิ ปฏิบัติงาน : - บาท : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Loading Line 2	120	26.4	23.7	32.7	32.6
Average (WBGT)		26.4			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 2491855
Date Received : Aug 28, 2024
Date Reported : Aug 31, 2024
Report Number: 3079079-1

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Sample Number	2491855-12
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Aug 27, 2024
Measurement by	Supot Salamtah
Location	ปฏิบัติงาน 1 ชั่วโมง (ดู-อุณหภูมิ ปฏิบัติงาน : - แทน : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Loading Line 3	120	28.2	25.6	34.3	34.2
Average (WBGT)		28.2			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

Page 1 of 12

Sample Number	24139551-1
Parameter	Heat Stress (Sampling Time : 01.00 PM - 03.00 PM)
Measurement Date	Dec 19, 2024
Measurement by	Nattakam Vornginyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ดู-อุณหภูมิ ปฏิบัติงาน : - แทน : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Reactor Line 1	120	29.7	23.8	44.9	40.9
Average (WBGT)		29.7			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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P/O : 4800043002
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Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

Page 2 of 12

Sample Number	24139551-2
Parameter	Heat Stress (Sampling Time : 01.00 PM - 03.00 PM)
Measurement Date	Dec 19, 2024
Measurement by	Nattakarn Vongiyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ปฏิบัติงาน อุณหภูมิ : - แสง : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Reactor Line 2	120	28.9	22.9	44.2	40.3
Average (WBGT)		28.9			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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Project Name :
Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

Page 3 of 12

Sample Number	24139551-3
Parameter	Heat Stress (Sampling Time : 01.00 PM - 03.00 PM)
Measurement Date	Dec 19, 2024
Measurement by	Nattakarn Vongiyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ปฏิบัติงาน อุณหภูมิ : - แสง : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Reactor Line 3	120	30.5	24.3	46.5	43.5
Average (WBGT)		30.5			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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Project Name :
Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

Page 4 of 12

Sample Number	24139551-4
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Dec 20, 2024
Measurement by	Nattakarn Vongiyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ปฏิบัติงาน อุณหภูมิ : - แสง : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 1	120	23.6	20.9	30.0	29.2
Average (WBGT)		23.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

Page 5 of 12

Sample Number	24139551-5
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Dec 20, 2024
Measurement by	Nattakarn Vongiyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ปฏิบัติงาน อุณหภูมิ : - แสง : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 2	120	25.0	21.5	33.1	31.9
Average (WBGT)		25.0			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

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Sample Number	24139551-6
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Dec 20, 2024
Measurement by	Nattakarn Vongiyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ปฏิบัติงาน อุณหภูมิ : - แสง : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Dryer Line 3	120	25.7	21.7	35.1	33.9
Average (WBGT) Guideline WBGT (°C)		25.7 34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

Page 10 of 12

Sample Number	24139551-10
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Dec 20, 2024
Measurement by	Nattakarn Vongiyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ปฏิบัติงาน อุณหภูมิ : - แสง : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Loading Line 1	120	21.8	19.6	26.8	26.2
Average (WBGT) Guideline WBGT (°C)		21.8 34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

1. Notification of Department Labour Protection and Welfare on the Criteria and Procedures for Measurement and Analysis of Working Conditions in relation to Heat, Light or Noise Levels, including Duration and Types of Business that must perform (B.E. 2561)
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Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

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Sample Number	24139551-11
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Dec 20, 2024
Measurement by	Nattakarn Vonghinyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ปฏิบัติงาน อุณหภูมิ : - แสง : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Loading Line 2	120	22.6	20.4	27.6	27.4
Average (WBGT)		22.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

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P/O : 4800043002
Project Name :
Project Location :
Lot ID: 24139551
Date Received : Dec 23, 2024
Date Reported : Dec 24, 2024
Report Number: 3189174-1

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Sample Number	24139551-12
Parameter	Heat Stress (Sampling Time : 10.00 AM - 12.00 PM)
Measurement Date	Dec 20, 2024
Measurement by	Nattakarn Vonghinyoo
Location	ปฏิบัติงาน 1 ชั่วโมง (ปฏิบัติงาน อุณหภูมิ : - แสง : -)

Location	Duration (min)	WBGT (°C)	NWB (°C)	GT (°C)	DB (°C)
Loading Line 3	120	22.6	20.5	27.6	27.3
Average (WBGT)		22.6			
Guideline WBGT (°C)		34.0			

Reference Method : Wet Bulb Globe Temperature

Guideline:

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คุณภาพอากาศในสถานที่ทำงาน



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :
Lot ID: 2468047
Date Received : Jul 11, 2024
Date Reported : Jul 19, 2024
Report Number : 3025570-1

Page 1 of 3

Sample Number 2468047-2
Sampled Date Jul 08, 2024
Sample Description Air Quality
Location Loading Line 2
Personal Sampling ภาณุวงษ์ ฐานยา (Respirable Dust)
Date Analysis Commenced Jul 12, 2024
Condition of Sample Drawn into two filter papers placed in each cassette and one amber plastic bottle, refrigerated
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.4 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing	10:00 AM - 12:00 PM	mg/m ³	-	0.15	<0.15	5	Based on NIOSH (1998), OSHA 0600	OSHA	Rayong
Sulfur dioxide	10:00 AM - 12:00 PM	ppm	-	0.004	<0.004	5	NIOSH (1994), P&CAM146	MOL	Bangkok
Total Dust	10:00 AM - 12:00 PM	mg/m ³	-	0.15	0.21	15	Based on NIOSH (1994), OSHA 0500	OSHA	Rayong

Guideline :
MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)
OSHA : Occupational Safety and Health Administration
Sampled By : Nattakarn Vornginyoo

Remark :
- LOD : Limit of Detection
- *C* : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

Orawan R.

Approved by
Orawan Rakhyong
Scientist (3)

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :
Lot ID: 2491856
Date Received : Aug 28, 2024
Date Reported : Sep 04, 2024
Report Number : 3079084-1

Page 1 of 11

Sample Number 2491856-1
Sampled Date Aug 27, 2024
Sample Description Air Quality
Location Loading Line 1
Personal Sampling ภาณุวงษ์ ฐานยา (Respirable Dust)
Date Analysis Commenced Aug 29, 2024
Condition of Sample Drawn into two filter papers placed in plastic cassette and one amber plastic bottle, refrigerated
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.8 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing	10:00 AM - 12:00 PM	mg/m ³	-	0.15	<0.15	5	Based on NIOSH (1998), OSHA 0600	OSHA	Rayong
Sulfur dioxide	10:00 AM - 12:00 PM	ppm	-	0.004	<0.004	5	NIOSH (1994), P&CAM146	MOL	Bangkok
Total Dust	10:00 AM - 12:00 PM	mg/m ³	-	0.15	0.17	15	Based on NIOSH (1994), OSHA 0500	OSHA	Rayong

Guideline :
MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)
OSHA : Occupational Safety and Health Administration
Sampled By : Sakonarin Jaraskay

Remark :
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Orawan R.

Approved by
Orawan Rakhyong
Scientist (3)

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Analysis / Test Report

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4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2491856
Date Received : Aug 28, 2024
Date Reported : Sep 04, 2024
Report Number : 3079084-1

Page 2 of 11

Sample Number 2491856-2
Sampled Date Aug 27, 2024
Sample Description Air Quality
Location Loading Line 2
Personal Sampling การสุ่มตัวอย่าง (Respirable Dust)
Date Analysis Commenced Aug 29, 2024
Condition of Sample Drawn into two filter papers placed in plastic cassette and one amber plastic bottle, refrigerated
Barometric Pressure 755 mmHg
Atmospheric Temperature 30.8 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Respirable Dust	10:00 AM - 12:00 PM	mg/m ³	-	0.15	<0.15	5	Based on NIOSH (1998), OSHA 0600	OSHA	Rayong
Sulfur dioxide	10:00 AM - 12:00 PM	ppm	-	0.004	<0.004	5	NIOSH (1994), P&CAM1-46	MOL	Bangkok
Total Dust	10:00 AM - 12:00 PM	mg/m ³	-	0.15	0.26	15	Based on NIOSH (1994), OSHA 0500	OSHA	Rayong

Guideline :
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OSHA : Occupational Safety and Health Administration
Sampled By : Saknarin Jaraskay

Remark :
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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 24139552
Date Received : Dec 23, 2024
Date Reported : Dec 28, 2024
Report Number : 3189178-1

Page 2 of 11

Sample Number 24139552-2
Sampled Date Dec 19, 2024
Sample Description Air Quality
Location Loading Line 2
Personal Sampling การสุ่มตัวอย่าง (Respirable Dust)
Date Analysis Commenced Dec 24, 2024
Condition of Sample Drawn into two filter papers placed in plastic cassette and one amber plastic bottle, refrigerated
Barometric Pressure 759 mmHg
Atmospheric Temperature 27.4 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Respirable Dust	09:00 AM - 11:00 AM	mg/m ³	-	0.15	<0.15	5	In-house method : STM 02-023 based on NIOSH Manual of Analytical Method, 4th ed., NIOSH, method 0600, Issue 3, 1998	OSHA	Rayong
Sulfur dioxide	09:00 AM - 11:00 AM	ppm	-	0.004	<0.004	5	NIOSH (1994), P&CAM1-46	MOL	Bangkok
Total Dust	09:00 AM - 11:00 AM	mg/m ³	-	0.15	0.63	15	In-house method : STM 02-022 based on NIOSH Manual of Analytical Method, 4th ed., NIOSH, method 0500, Issue 2, 1994	OSHA	Rayong

Guideline :
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OSHA : Occupational Safety and Health Administration
Sampled By : Saknarin Jaraskay

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Orawan R.

Approved by

Orawan Rakhyong
Scientist (3)

Saengye C.

Approved by

Saranya Chalerthamhong
Scientist (4)



Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 24139552
Date Received : Dec 23, 2024
Date Reported : Dec 28, 2024
Report Number : 3189178-1

Page 3 of 11

Sample Number 24139552-3
Sampled Date Dec 19, 2024
Sample Description Air Quality
Location Loading Line 3
Personal Sampling การสุ่มตัวอย่าง (Respirable Dust)
Date Analysis Commenced Dec 24, 2024
Condition of Sample Drawn into two filter papers placed in plastic cassette and one amber plastic bottle, refrigerated
Barometric Pressure 759 mmHg
Atmospheric Temperature 27.4 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Respirable Dust	09:00 AM - 11:00 AM	mg/m3	-	0.15	<0.15	5	In-house method : STM 02-023 based on NIOSH Manual of Analytical Method, 4th ed., NIOSH, method 0600, Issue 3, 1998	OSHA	Rayong
Sulfur dioxide	09:00 AM - 11:00 AM	ppm	-	0.004	<0.004	5	NIOSH (1994), P8CAM146	MOL	Bangkok
Total Dust	09:00 AM - 11:00 AM	mg/m3	-	0.15	0.25	15	In-house method : STM 02-022 based on NIOSH Manual of Analytical Method, 4th ed., NIOSH, method 0500, Issue 2, 1994	OSHA	Rayong

Guideline :
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OSHA : Occupational Safety and Health Administration
Sampled By : Saknarin Jaraskay

Remark :
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Saranya C.

Approved by
Saranya Chalmhamrong
Scientist (4)

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Analysis / Test Report

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4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2491856
Date Received : Aug 28, 2024
Date Reported : Sep 04, 2024
Report Number : 3079084-1

Page 3 of 11

Sample Number 2491856-3
Sampled Date Aug 27, 2024
Sample Description Air Quality
Location Loading Line 3
Personal Sampling การสุ่มตัวอย่าง (Respirable Dust)
Date Analysis Commenced Aug 29, 2024
Condition of Sample Drawn into two filter papers placed in plastic cassette and one amber plastic bottle, refrigerated
Barometric Pressure 735 mmHg
Atmospheric Temperature 30.8 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Respirable Dust	10:00 AM - 12:00 PM	mg/m3	-	0.15	<0.15	5	Based on NIOSH (1998), 0600	OSHA	Rayong
Sulfur dioxide	10:00 AM - 12:00 PM	ppm	-	0.004	<0.004	5	NIOSH (1994), P8CAM146	MOL	Bangkok
Total Dust	10:00 AM - 12:00 PM	mg/m3	-	0.15	0.30	15	Based on NIOSH (1994), 0500	OSHA	Rayong

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OSHA : Occupational Safety and Health Administration
Sampled By : Saknarin Jaraskay

Remark :
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Orawan R.

Approved by
Orawan Rakyong
Scientist (3)

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Analysis / Test Report

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4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 24139552
Date Received : Dec 23, 2024
Date Reported : Dec 28, 2024
Report Number : 3189178-1

Page 1 of 11

Sample Number 24139552-1
Sampled Date Dec 20, 2024
Sample Description Air Quality
Location Loading Line 1
Personal Sampling อุปกรณ์ ทุฟดู
Date Analysis Commenced Dec 24, 2024
Condition of Sample Drawn into two filter papers placed in plastic cassette and one amber plastic bottle, refrigerated
Barometric Pressure 759 mmHg
Atmospheric Temperature 27.4 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Respirable Dust	10:00 AM - 12:00 PM	mg/m ³	-	0.15	<0.15	5	In-house method : STM 02-023 based on NIOSH Manual of Analytical Method, 4th ed., NIOSH, method 0600, Issue 3, 1998	OSHA	Rayong
Sulfur dioxide	10:00 AM - 12:00 PM	ppm	-	0.004	<0.004	5	NIOSH (1994), P&CAM146	MOL	Bangkok
Total Dust	10:00 AM - 12:00 PM	mg/m ³	-	0.15	0.29	15	In-house method : STM 02-022 based on NIOSH Manual of Analytical Method, 4th ed., NIOSH, method 0500, Issue 2, 1994	OSHA	Rayong

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OSHA : Occupational Safety and Health Administration
Sampled By : Saknarin Jarasakay

Remark :
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Sanyat C.

Approved by

Saranya Chalmthamrong
Scientist (4)

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bankhai, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2495413
Date Received : Dec 25, 2024
Date Reported : Jan 03, 2025
Report Number : 3087000-1

Page 1 of 3

Sample Number 2495413-1
Sampled Date Dec 24, 2024
Sample Description Air Quality
Location Loading Line 1
Personal Sampling อุปกรณ์ ทุฟดู
Date Analysis Commenced Dec 26, 2024
Condition of Sample Drawn into two filter papers placed in plastic cassette and one amber plastic bottle, refrigerated
Barometric Pressure 759 mmHg
Atmospheric Temperature 26.7 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOR)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Respirable Dust	10:00 AM - 12:00 PM	mg/m ³	-	0.15	<0.15	5	In-house method : STM 02-023 based on NIOSH Manual of Analytical Method, 4th ed., NIOSH, method 0600, Issue 3, 1998	OSHA	Rayong
Sulfur dioxide	10:00 AM - 12:00 PM	ppm	-	0.004	<0.004	5	NIOSH (1994), P&CAM146	MOL	Bangkok
Total Dust	10:00 AM - 12:00 PM	mg/m ³	-	0.15	0.50	15	In-house method : STM 02-022 based on NIOSH Manual of Analytical Method, 4th ed., NIOSH, method 0500, Issue 2, 1994	OSHA	Rayong

Guideline :
MOL : Announcement of the Department of Labour Protection and Welfare on Threshold Limit Values of Hazardous Chemical Substances Dated August 3, B.E. 2560 (2017)
OSHA : Occupational Safety and Health Administration
Sampled By : Nattakam Vonginyoo

Remark :
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Sanyat C.

Approved by

Saranya Chalmthamrong
Scientist (4)

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Analysis / Test Report

Client : Bridgestone Carbon Black (Thailand) Co., Ltd.
4/11 Moo 2, T. Nongbua, A. Bangkok, Rayong Thailand 21120
P/O : 4800043002
Project Name :
Project Location :

Lot ID: 2495413
Date Received : Dec 25, 2024
Date Reported : Jan 03, 2025
Report Number : 3087000-1

Page 2 of 3

Sample Number 2495413-2
Sampled Date Dec 24, 2024
Sample Description Air Quality
Location Loading Line 3
Personal Sampling ๑๙๙๙๙๙ ๙๙๙๙๙๙๙๙
Date Analysis Commenced Dec 26, 2024
Condition of Sample Drawn into two filter papers placed in plastic cassette and one amber plastic bottle, refrigerated
Barometric Pressure 759 mmHg
Atmospheric Temperature 26.7 °C

Analyte	Sampled Date/Time	Unit	LOD	LOQ (LOH)	Result	Guideline Limit	Method	Guideline	Testing Location
Air Testing									
Respirable Dust	10:00 AM - 12:00 PM	mg/m3	-	0.15	<0.15	5	In-house method : STM 02-023 based on NIOSH Manual of Analytical Method, 4th ed., NMAM, method 0600, Issue 3, 1998	OSHA	Rayong
Sulfur dioxide	10:00 AM - 12:00 PM	ppm	-	0.004	<0.004	5	NIOSH (1994), P&CAM146	MOL	Bangkok
Total Dust	10:00 AM - 12:00 PM	mg/m3	-	0.15	0.25	15	In-house method : STM 02-022 based on NIOSH Manual of Analytical Method, 4th ed., NMAM, method 0500, Issue 2, 1994	OSHA	Rayong

Guideline :
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OSHA : Occupational Safety and Health Administration
Sampled By : Nattakarn Vongthyo

Remark :
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Approved by

Scientist (4)

Signature
Saranya Chalmthamrong

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ภาคผนวก ง

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

right solutions.
right partner.

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Nitrogen Dioxide	NO _x Analyzer	RYG_FS0535	3-Jul-24	3-Jan-25	6
Ambient	Nitrogen Dioxide	NO _x Analyzer	RYG_FS0535	3-Jul-24	3-Jan-25	6
Ambient	Nitrogen Dioxide	NO _x Analyzer	RYG_FS0535	3-Jul-24	3-Jan-25	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0534	3-Jul-24	3-Jan-25	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0534	3-Jul-24	3-Jan-25	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_FS0534	3-Jul-24	3-Jan-25	6
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0535	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0535	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0535	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	RYG_EN0001	22-Feb-24	22-Feb-25	12
Ambient	Total Suspended Particulate	High Volume	RYG_FS0534	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0534	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0534	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	22-Feb-24	22-Feb-25	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0605	10-Jul-24	10-Jan-25	10
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_FS0605	10-Jul-24	10-Jan-25	10
Stack	Oxides of Nitrogen	Console Control Unit	BXX_FS0586	10-Jul-24	10-Jan-25	6
Stack	Oxides of Nitrogen	Pitot Tube	BXX_FS0586	10-Jul-24	10-Jan-25	6
Stack	Oxides of Nitrogen	Flue gas Analyzer	RYG_FS0565	15-Nov-23	12-Nov-24	12
Stack	Oxides of Nitrogen	Vacuum Gauge	RYG_FS0555	30-Mar-25	30-Sep-24	10
Stack	Oxides of Nitrogen	SPECTROPHOTOMETER	RYG_EN0179	15-Sep-25	15-Mar-26	10
Stack	Sulfur Dioxide	Console Control Unit	BXX_FS0586	10-Jul-24	10-Jan-25	6
Stack	Sulfur Dioxide	Pitot Tube	BXX_FS0586	10-Jul-24	10-Jan-25	6
Stack	Sulfur Dioxide	Flue gas Analyzer	RYG_FS0565	15-Nov-23	12-Nov-24	12
Stack	Sulfur Dioxide	Dry Gas	BXX_FS0565	10-Jul-24	10-Jan-25	6
Stack	Total Suspended Particulate	Console Control Unit	BXX_FS0586	10-Jul-24	10-Jan-25	6
Stack	Total Suspended Particulate	Pitot Tube	BXX_FS0586	10-Jul-24	10-Jan-25	6
Stack	Total Suspended Particulate	Flue gas Analyzer	RYG_FS0565	15-Nov-23	12-Nov-24	12
Stack	Total Suspended Particulate	Digital Balance	RYG_EN0005	22-Feb-24	22-Feb-25	12
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0215	23-Feb-24	27-Feb-25	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0025	22-Jan-24	21-Jan-25	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0025	25-Jan-24	24-Jan-25	12
Noise	Leq 5 hrs	Sound Calibrator	RYG_FS0215	23-Feb-24	27-Feb-25	12
Noise	Leq 5 hrs	Sound Level Meter	RYG_FS0025	23-Feb-24	22-Feb-25	12
Noise	Leq 5 hrs	Sound Level Meter	RYG_FS0025	5-Jan-24	4-Jan-25	12
Noise	Leq 5 hrs	Sound Level Meter	RYG_FS0025	19-Oct-23	19-Oct-24	12
Noise	Leq 5 hrs	Sound Calibrator	RYG_FS0496	26-Jan-24	25-Jan-25	12
Noise	Leq 5 hrs	Sound Level Meter	RYG_FS0024	25-Jan-24	24-Jan-25	12
Noise	Leq 5 hrs	Sound Level Meter	RYG_FS0019	22-Jan-24	21-Jan-25	12
Noise	Leq 5 hrs	Sound Level Meter	RYG_FS0025	22-Jan-24	21-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0577	15-Jan-24	14-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0579	6-Aug-24	6-Aug-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0586	12-Jan-24	11-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0581	25-Jan-24	24-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0581	7-Aug-24	7-Aug-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0580	7-Aug-24	7-Aug-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0579	6-Aug-24	6-Aug-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0525	26-Jan-24	25-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0520	25-Jan-24	24-Jan-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0581	7-Aug-24	7-Aug-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0580	7-Aug-24	7-Aug-25	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0578	6-Aug-24	6-Aug-25	12

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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Total Dust	Field Rotameter	RYG_FS0190	1-Jul-24	1-Oct-24	3
Workplace	Total Dust	DRICAL FLOWMETER	BXX_FS1546	25-Jan-24	25-Jan-25	12
Workplace	Total Dust	Digital Balance	RYG_EN0004	22-Feb-24	22-Feb-25	12
Workplace	Respirable Dust	Field Rotameter	RYG_FS0190	1-Jul-24	1-Oct-24	3
Workplace	Respirable Dust	DRICAL FLOWMETER	BXX_FS1546	25-Jan-24	25-Jan-25	12
Workplace	Respirable Dust	Digital Balance	RYG_EN0004	22-Feb-24	22-Feb-25	12
Water Lab	pH at 25 °C	pH meter	BXX_EN0242	17-Oct-24	17-Oct-25	12
Water Lab	Temperature	pH meter	BXX_L50075	31-May-24	31-May-25	12
Water Lab	BOD	DO Meter	BXX_EN0017	16-Nov-23	16-May-25	18
Water Lab	BOD	Incubator	BXX_EN0272	23-Aug-24	23-Aug-25	12
Water Lab	BOD	Burette	BXX_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	COD	Hot Block	BXX_EN0222	22-Apr-24	22-Apr-25	12
Water Lab	COD	Spectrophotometer	BXX_EN0010	13-Sep-24	13-Sep-25	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BXX_EN0005	2-Aug-24	2-Aug-25	12
Water Lab	Total Suspended Solids	Oven	BXX_EN0273	14-May-24	14-Nov-25	18
Water Lab	Total Dissolved Solids 100°C	Electronic Top-Loading Balance	BXX_EN0005	2-Aug-24	2-Aug-25	12
Water Lab	Total Dissolved Solids 100°C	Oven	BXX_EN0273	14-May-24	14-Nov-25	18
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BXX_EN0005	2-Aug-24	2-Aug-25	12
Water Lab	Oil & Grease	Water Bath	BXX_EN0140	4-Jul-25	4-Jan-26	18
Water Lab	Total Kjeldahl Nitrogen	Digestion Unit	BXX_EN0246	21-Jan-24	21-Jan-25	12
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BXX_EN0087	16-Aug-24	16-Aug-25	12

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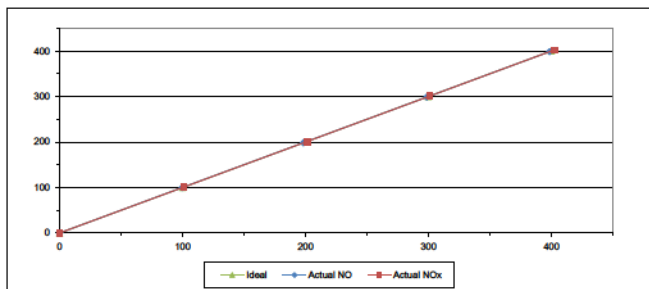
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MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jul-24	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	7239	Equipment ID	RYG_FS0535
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.80	-0.20	-0.20	101.00	1.00	1.00
2	200.00	198.30	-1.70	-0.85	201.30	1.30	0.65
3	300.00	298.80	-1.20	-0.40	301.20	1.20	0.40
4	400.00	398.70	-1.30	-0.33	402.30	2.30	0.58
AVERAGE (%)				-0.33			0.55



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)
Assistant General Manager

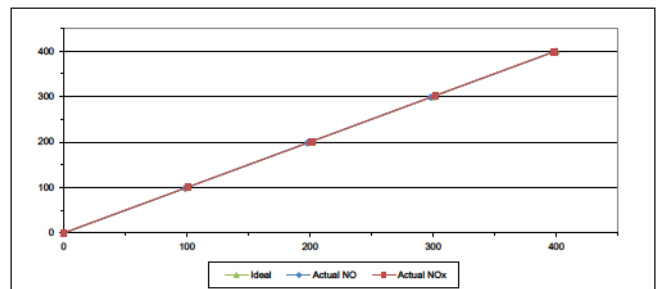
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	2-Jul-24	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	2198	Equipment ID	RYG_FS0252
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.70	-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



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)
Assistant General Manager

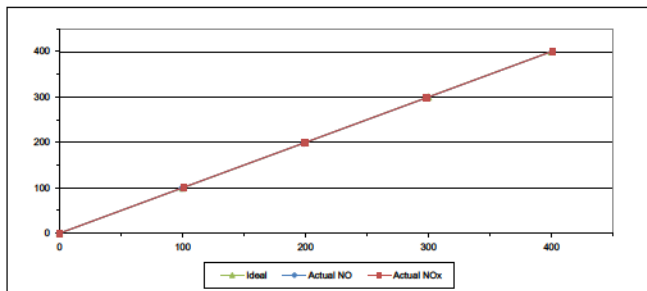
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	3-Jul-24	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	AWXG87CR	Equipment ID	RYG_FS0453
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	101.10	1.10	1.10
2	200.00	198.60	-1.40	-0.70	199.80	-0.20	-0.10
3	300.00	299.00	-1.00	-0.33	298.60	-1.40	-0.47
4	400.00	401.10	1.10	0.28	401.10	1.10	0.28
AVERAGE (%)				-0.21			0.18



Calibrated By

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

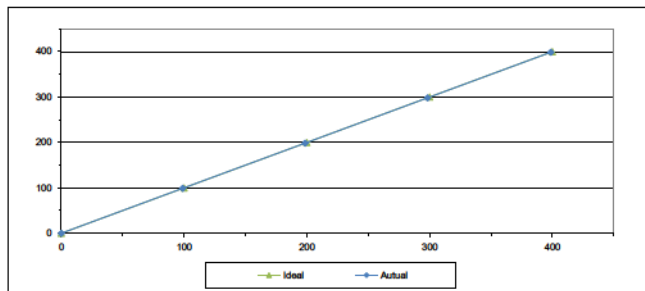
Approved By

(Mr. Sarayuth Jitranont)
Assistant General ManagerALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12

MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jul-24	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	T100
Serial No.	6061	Equipment ID	RYG_FS0534
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.90	-1.10	-1.10
2	200.00	198.70	-1.30	-0.65
3	300.00	298.30	-1.70	-0.57
4	400.00	398.70	-1.30	-0.33
AVERAGE (%)				-0.51



Calibrated By

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

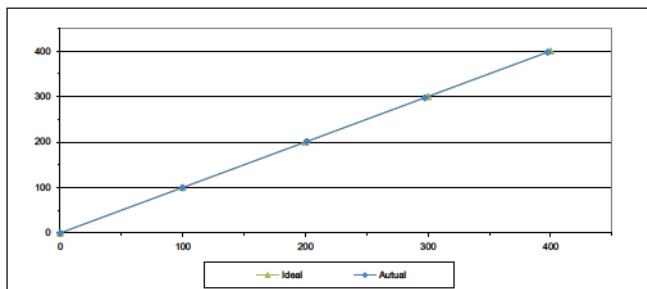
Approved By

(Mr. Sarayuth Jitranont)
Assistant General ManagerALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12

MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jul-24	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	T100
Serial No.	1773	Equipment ID	RYG_FS0251
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40
2	200.00	201.20	1.20	0.60
3	300.00	297.30	-2.70	-0.90
4	400.00	397.60	-2.40	-0.60
AVERAGE (%)				-0.24



Calibrated By

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

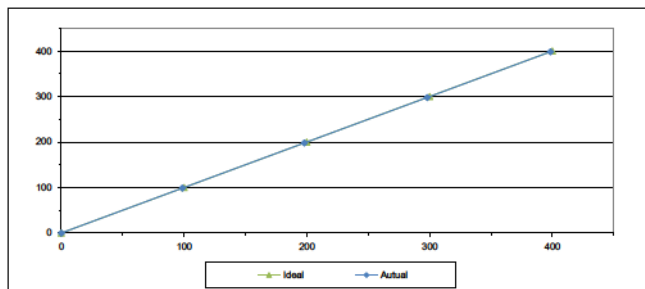
Approved By

(Mr. Sarayuth Jitranont)
Assistant General ManagerALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12

MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jul-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	90U0XJ31	Equipment ID	RYG_FS0452
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.60	-1.40	-1.40
2	200.00	198.00	-2.00	-1.00
3	300.00	298.00	-2.00	-0.67
4	400.00	398.50	-1.50	-0.37
AVERAGE (%)				-0.67



Calibrated By

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

Approved By

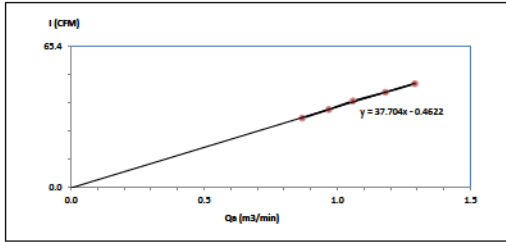
(Mr. Sarayuth Jitranont)
Assistant General ManagerALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



High Volume Air Sampler Calibration Worksheet

Project Site: Bridgestone Carbon Black (Thailand) Co., Ltd. Barometric Pressure (mm Hg): 752.9
Calibrate Location: สุพรรณบุรี (A1) Temperature (°C): 34.2
Calibrate Date: 7-Sep-24 High Volume ID: RYG_P50295
Calibration Sheet No.: C-070924-RYG_P50295 High Volume Model: TE-5009X
Calibrator ID: RYG_P50205 High Volume S/N: 5502
Calibrator Model: TE-5028A Calibrator Slope: 0.95561
Calibrator S/N: 1166 Calibrator Intercept: -0.02266

Test No.	Delta H ₂ O (Inch)	Qa (m ³ /min)	I: Chart (CFM)	Linear Regression
1	1.6	0.968	32	Slope: 37.7045 Intercept: -0.4622 Correlation Coefficient: 0.9986
2	2.0	0.968	36	
3	2.4	1.058	40	
4	3.0	1.180	44	
5	3.6	1.291	48	



Calibrated by: Parunat W.
(Mr. Panuwat Wanghong)
Field Scientist(1)

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

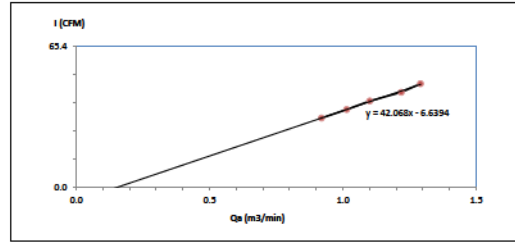
FORM NO.: F 06-074 REVISION NO.:2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site: Bridgestone Carbon Black (Thailand) Co., Ltd. Barometric Pressure (mm Hg): 752.9
Calibrate Location: สุพรรณบุรี (A2) Temperature (°C): 34.2
Calibrate Date: 7-Sep-24 High Volume ID: RYG_P50183
Calibration Sheet No.: C-070924-RYG_P50183 High Volume Model: TE-5009X
Calibrator ID: RYG_P50205 High Volume S/N: 4791
Calibrator Model: TE-5028A Calibrator Slope: 0.95561
Calibrator S/N: 1166 Calibrator Intercept: -0.02266

Test No.	Delta H ₂ O (Inch)	Qa (m ³ /min)	I: Chart (CFM)	Linear Regression
1	1.8	0.919	32	Slope: 42.0676 Intercept: -6.6394 Correlation Coefficient: 0.9981
2	2.2	1.014	36	
3	2.6	1.100	40	
4	3.2	1.218	44	
5	3.6	1.291	48	



Calibrated by: Parunat W.
(Mr. Panuwat Wanghong)
Field Scientist(1)

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

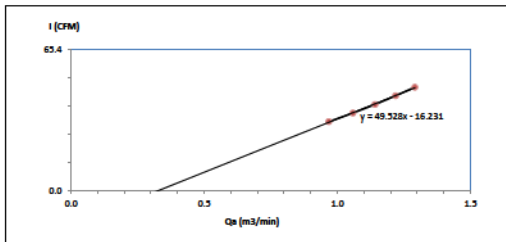
FORM NO.: F 06-074 REVISION NO.:2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site: Bridgestone Carbon Black (Thailand) Co., Ltd. Barometric Pressure (mm Hg): 752.9
Calibrate Location: สุพรรณบุรี (A3) Temperature (°C): 34.2
Calibrate Date: 7-Sep-24 High Volume ID: RYG_P50397
Calibration Sheet No.: C-070924-RYG_P50397 High Volume Model: TE-5009X
Calibrator ID: RYG_P50205 High Volume S/N: 5687
Calibrator Model: TE-5028A Calibrator Slope: 0.95561
Calibrator S/N: 1166 Calibrator Intercept: -0.02266

Test No.	Delta H ₂ O (Inch)	Qa (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.0	0.968	32	Slope: 49.5282 Intercept: -16.2311 Correlation Coefficient: 0.9991
2	2.4	1.058	36	
3	2.8	1.141	40	
4	3.2	1.218	44	
5	3.6	1.291	48	



Calibrated by: Parunat W.
(Mr. Panuwat Wanghong)
Field Scientist(1)

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

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

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-6, e-mail: service.thailand@sartorius.com



SARTORIUS
NSC-TIS-175 17025
CALIBRATION 0426

Certificate of Calibration

Model Number: LA130S-F Certificate No.: 24BCI0068
Description: Analytical Balance Issued Date: Friday, February 23, 2024
Serial Number: 25409864 Reference No.: 228198
ID No.: RYG_EN0001
Manufacturer: Sartorius Page No.: 1 of 1

Customer Name: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.
Calibrated Place: ALS Laboratory Group (Thailand) Co., Ltd.(Balance Room)
616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.

Calibrated By: Mr.Chonchai Inthana Calibration Procedure No.: This calibration was conducted by Using in-house calibration procedure number (WI-003) Based on UKAS LAB 14 : 2019
Calibration Date: Thursday, February 22, 2024

Metrological data : Capacity: 150 g Readability: 0.0001 g
Reasons for calibration ☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ Maintenance
Ambients Conditions: Temperature: 23.6 °C ± 5.0 °C
Humidity: 54.0 % RH ± 10.0 % RH
Pressure: ±
Equipment Condition: ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref :Lab 14
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2.YCS011-522-00	TCS	M2308197S	23-Aug-2025
MHB-382SD	Humidity/Barometer/Temp. Lutron MHB-382SD	DKSH	C19231845	23-Aug-2024

This certificate relate and apply this equipment only.

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

SOP FM 33 03 February 2022

Mr.chonchai Inthana(Technical Manager)

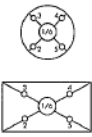




Certificate of Calibration

Model Number : LA130S-F Certificate No. : 24BCI0068
Description : Analytical Balance Issued Date : Friday, February 23, 2024
Serial Number : 25409864 Reference No. : 229196
ID No. : RYG_EN0001
Manufacturer : Sartorius Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability			Eccentricity (Off-center loading error)		
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.			The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/2 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).		
Nominal Value : (Low Load)	10.0000	99.9999	Nominal value :	50	g
10 g	10.0000	100.0000	Tolerance	0.0004	g
Tolerance	0.0001 g	100.0001			
	10.0000	100.0000			
	10.0000	100.0001			
	9.9999	100.0000			
Nominal Value : (High Load)	10.0000	100.0001			
100 g	10.0000	100.0000			
Tolerance	0.0001 g	100.0002			
	9.9999	100.0002			
	9.9999	100.0001			
Standard Deviation	0.00005	0.00008			

Linearity				
The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.				
Tolerance	0.0002 g			
Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00020
0.05	0.0500	0.0500	0.0000	0.00021
0.1	0.1000	0.1000	0.0000	0.00021
0.5	0.5000	0.5000	0.0000	0.00021
1	1.0000	1.0000	0.0000	0.00021
2	2.0000	2.0000	0.0000	0.00021
5	5.0000	5.0000	0.0000	0.00021
10	10.0000	10.0001	0.0001	0.00024
20	20.0000	20.0001	0.0001	0.00021
100	100.0000	99.9999	-0.0001	0.00024

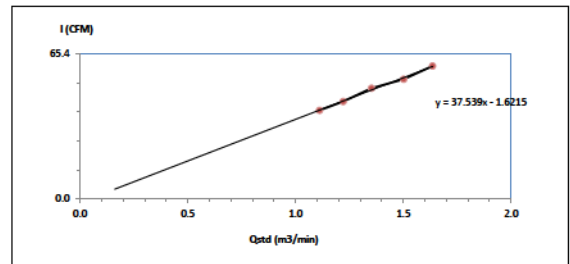
End of Report.

SOP FM 33 03 February 2022

High Volume Air Sampler Calibration Worksheet

Project Site : Bridgestone Carbon Black (Thailand) Co., Ltd. Barometric Pressure (mm Hg) : 752.9
Calibrate Location : บ้านห้วยน้ำเค็ม (A1) Temperature (°C) : 34.2
Calibrate Date : 7-Sep-24 High Volume ID : RYG FS0396
CalibrationSheet No. : C-070924-RYG FS0396 High Volume Model : TE-S170D
Calibrator ID : RYG FS0205 High Volume S/N : 5688
Calibrator Model : TE-5028A Calibrator Slope : 1.52567
Calibrator S/N : 1166 Calibrator Intercept : -0.03613

Test No.	Delta H ₂ O (inch)	Q _{del} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.8	1.1113	40	Slope : 37.5387
2	3.4	1.2209	44	Intercept : -1.6215
3	4.2	1.3529	50	Correlation Coefficient : 0.9973
4	5.2	1.5013	54	
5	6.2	1.6360	60	



Calibrated by : Panuwat W.
(Mr. Panuwat Wangbong)
Field Scientist(1)

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

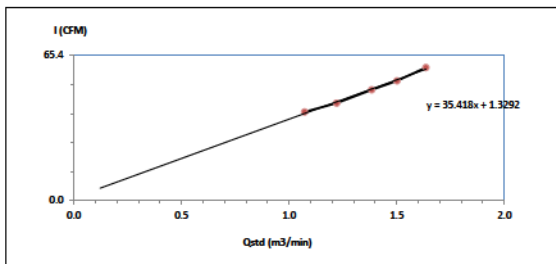
FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : Bridgestone Carbon Black (Thailand) Co., Ltd. Barometric Pressure (mm Hg) : 752.9
Calibrate Location : บ้านห้วยน้ำเค็ม (A2) Temperature (°C) : 34.2
Calibrate Date : 7-Sep-24 High Volume ID : RYG FS0395
CalibrationSheet No. : C-070924-RYG FS0395 High Volume Model : TE-S170D
Calibrator ID : RYG FS0205 High Volume S/N : 5692
Calibrator Model : TE-5028A Calibrator Slope : 1.52567
Calibrator S/N : 1166 Calibrator Intercept : -0.03613

Test No.	Delta H ₂ O (inch)	Q _{del} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.6	1.0722	40	Slope : 35.4184
2	3.4	1.2209	44	Intercept : 1.3292
3	4.4	1.3839	50	Correlation Coefficient : 0.9966
4	5.2	1.5013	54	
5	6.2	1.6360	60	



Calibrated by : Panuwat W.
(Mr. Panuwat Wangbong)
Field Scientist(1)

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

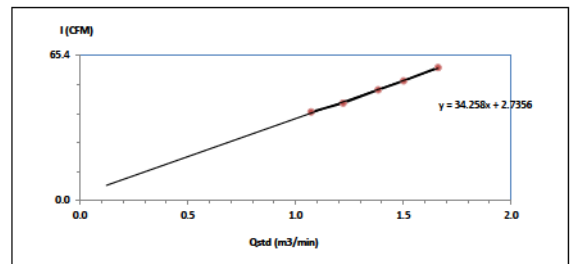
FORM NO.: F 06-073 REVISION NO.:2 ISSUE DATE: 20/11/23



High Volume Air Sampler Calibration Worksheet

Project Site : Bridgestone Carbon Black (Thailand) Co., Ltd. Barometric Pressure (mm Hg) : 752.9
Calibrate Location : บ้านห้วยน้ำเค็ม (A3) Temperature (°C) : 34.2
Calibrate Date : 7-Sep-24 High Volume ID : RYG FS0291
CalibrationSheet No. : C-070924-RYG FS0291 High Volume Model : TE-S170D
Calibrator ID : RYG FS0205 High Volume S/N : 5333
Calibrator Model : TE-5028A Calibrator Slope : 1.52567
Calibrator S/N : 1166 Calibrator Intercept : -0.03613

Test No.	Delta H ₂ O (inch)	Q _{del} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.6	1.0722	40	Slope : 34.2578
2	3.4	1.2209	44	Intercept : 2.7356
3	4.4	1.3839	50	Correlation Coefficient : 0.9985
4	5.2	1.5013	54	
5	6.4	1.6616	60	



Calibrated by : Panuwat W.
(Mr. Panuwat Wangbong)
Field Scientist(1)

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

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

MEASUREMENT RESULTS¹

The Cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section and the standard air velocity 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from top of the test section, UUC was mounted on a round vertical tube of the lower plate at center of test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{uuc} (m/s)	Error (m/s)	U (k=2) (m/s)
0.997	24.78	24.45	0.8	-0.2	0.31
2.014	24.20	24.45	1.8	-0.2	0.31
2.990	24.80	24.45	2.9	-0.1	0.31
4.102	24.80	24.45	3.8	-0.3	0.31
4.97	24.80	24.45	5.0	0.0	0.31
5.98	24.50	24.45	6.0	0.0	0.31
7.03	24.70	24.45	7.1	0.3	0.31
7.95	24.38	24.45	8.1	0.1	0.31
9.04	24.70	24.45	9.1	0.3	0.31
9.98	24.36	24.45	10.2	0.2	0.31
10.99	24.80	24.45	11.2	0.2	0.31
12.03	24.40	24.45	12.2	0.2	0.31
12.97	24.70	24.45	13.2	0.2	0.31
14.10	24.50	24.45	14.3	0.2	0.31
15.03	24.70	24.45	15.2	0.2	0.31
15.99	24.58	24.45	16.2	0.2	0.31

Remarks:

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

² Velocity of standard

³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



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



CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalyne
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-AS5009
Data logger: AS5009
ID NUMBER : RYU_F50608
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION

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

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

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (24.5) °C, (43.4) %RH and (1006.7) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lerlaphol



Approved signature: Mr. Parinya Booncharoen
Calibration Department Manager

REVIEW BY: Parinya P.
APPROVED BY: Mr. Sorawit Thachalad
NEXT CAL. DATE: 18/1/26

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

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

MEASUREMENT RESULTS¹

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

Air speed m/s	D ¹ _{std} Degree (°)	D ² _{uuc} Degree (°)	Error Degree (°)	U (k=2) Degree (°)
	0.000	0	0	0.80
	45.000	41	-4	0.80
	90.000	87	-3	0.80
	135.000	132	-3	0.80
5.04	180.000	178	-2	0.80
	225.000	225	0	0.80
	270.000	272	2	0.80
	315.000	319	4	0.80

Remarks:

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

² Direction of standard

³ Direction of Unit Under Calibration



CERTIFICATE OF CALIBRATION

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalyne
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-D
SERIAL NUMBER : Sensor: WSD-AS5009
Data logger: AS5009
ID NUMBER : RYU_F50608
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION

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

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

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (22.4) °C, (43.3) %RH and (1004.5) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lerlaphol



Approved signature: Mr. Parinya Booncharoen
Calibration Department Manager

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

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

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-120-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Data Logger with Temperature sensor
MANUFACTURER : Novalynx
MODEL/TYPE : 110-WS-25DL-D
SERIAL NUMBER : A5909
ID NUMBER : RYG_FS0608
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The temperature calibration was done by In-House calibration method (as WP-CL-001) according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use 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: 17-0047-24, Certificate number: ER 0202-23

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667582-09,
Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 Sep 2024

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'

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 3: This equipment was connected with temperature sensor Model: HMP60 S/N: U3641220.
Dimension: Diameter 12 mm. Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.047	19.8	-0.2	0.099
80	25.043	24.8	-0.2	0.099
80	30.034	29.8	-0.2	0.099
80	35.028	34.8	-0.2	0.099
80	40.018	39.7	-0.3	0.16

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



Calibrated by:
☐ Mr. Sorawit Thachalad
☒ Miss Jittaporn Lertsomphol
☐ Miss Ruangrumpal Phoommit



Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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

CERTIFICATE OF CALIBRATION

Certificate No. : CRT-022-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Relative humidity with data logger
MANUFACTURER : Novalynx
MODEL/TYPE : Data Logger: 110-WS-25DL-D
Sensor: HMP60
SERIAL NUMBER : Data Logger: A5909
Sensor: U3643220
ID NUMBER : RYG_FS0608
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan Rd., Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 08 Jul 2024
MEASUREMENT DATE : 18 Jul 2024
ISSUE DATE : 18 Jul 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The Relative humidity and Air Temperature calibration was done by In-House calibration method as WP-CL-009 and WP-CL-010 according to comparison method with Standard, Chilled Mirror Hygrometer with Temperature sensor and standard Humidity generator chamber.

Traceability:
The measurements are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: 16-070-23 and through Jiranatee Associates Co., Ltd. Certificate number: CDT-001-67.

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'

Measurement Results:

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

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Table 1: The results of calibration of relative humidity at 30 °C are reported in table below.

Calibration Range: 20%RH to 80%RH

Air Temperature (°C)	Standard Reading (%RH)	UUC Reading (%RH)	Error (%RH)	Uncertainty (%RH)
29.79	19.49	17.5	-1.9	0.83
29.82	50.54	47.3	-3.3	1.3
29.81	81.68	77.1	-4.6	2.3

UUC*: Unit Under Calibration

End of Certificate of Calibration



Calibrated by:
☐ Mr. Sorawit Thachalad
☒ Miss Jittaporn Lertsomphol
☐ Miss Ruangrumpal Phoommit



Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

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

Certificate Number

CWS-001-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM: Cup anemometer
MANUFACTURER: Novolyx
MODEL/TYPE: Sensor: WS-02F
Data logger: 110-WS-25DL-0
SERIAL NUMBER: Sensor: WSD-A5662
Data logger: A5662
ID NUMBER: RYB_F30544
CONDITION AS RECEIVED: Used item
CUSTOMER: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE: 11 Jul 2023
MEASUREMENT DATE: 21 Jul 2023
ISSUE DATE: 21 Jul 2023

ENVIRONMENTAL CONDITIONS:

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

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

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

Preconditioning: 24 hours at ambient conditions.
Measurement Condition: The average values during measurement are (24.0) °C, (41.7) %RH and (1009.1) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawit Thachalad
☐ Miss Jitragorn Lertsomphol



Approved signatory:

Manom P
Mr. Parinya Booncharoen
Calibration Department Manager

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

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

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

The cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 300 mm respectively away from wind tunnel nozzle, UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V _{unc} (m/s)	Error (m/s)	U (k=2) (m/s)
1.024	23.84	23.95	0.8	-0.2	0.31
2.079	24.08	23.95	1.8	-0.3	0.31
3.019	24.04	23.95	2.8	-0.2	0.31
4.150	24.12	23.95	3.9	-0.3	0.31
5.00	23.72	23.95	4.8	-0.2	0.31
5.99	23.88	23.95	5.8	-0.2	0.31
7.04	23.68	23.95	6.9	-0.2	0.31
8.15	23.64	23.95	7.9	-0.3	0.31
9.09	23.50	23.95	8.9	-0.1	0.31
10.05	23.40	23.95	9.9	-0.4	0.31
11.13	23.48	23.95	11.0	-0.2	0.31
12.11	23.40	23.95	12.0	-0.1	0.31
13.16	23.50	23.95	13.0	-0.1	0.31
14.22	23.40	23.95	14.0	-0.2	0.31
15.22	23.50	23.95	15.0	-0.2	0.31
16.27	23.44	23.95	16.1	-0.2	0.31

Remark:

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

² Velocity of standard

³ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



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



Certificate Number

CWD-001-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM: Wind Direction Sensor
MANUFACTURER: Novolyx
MODEL/TYPE: Sensor: WS-02F
Data logger: 110-WS-25DL-0
SERIAL NUMBER: Sensor: WSD-A5662
Data logger: A5662
ID NUMBER: RYB_F30544
CONDITION AS RECEIVED: Used item
CUSTOMER: ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE: 11 Jul 2023
MEASUREMENT DATE: 21 Jul 2023
ISSUE DATE: 21 Jul 2023

ENVIRONMENTAL CONDITIONS:

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

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

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

Preconditioning: 24 hours at ambient conditions.
Measurement Condition: The average values during measurement are (23.8) °C, (43.0) %RH and (1011.6) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
☒ Mr. Sorawit Thachalad
☐ Miss Jitragorn Lertsomphol



Approved signatory:

Manom P
Mr. Parinya Booncharoen
Calibration Department Manager

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

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

Certificate Number

CWS-001-66

Page 2 of 2 Pages

MEASUREMENT RESULTS¹

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

Air speed m/s	D ⁺ _{ref} Degree (°)	D ⁻ _{ref} Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.00	45.000	41	-4	1.0
	90.000	87	-3	1.0
	135.000	132	-3	1.0
	180.000	180	0	1.0
	225.000	228	3	1.0
	270.000	273	3	1.0
	315.000	318	3	1.0
	360.000	359	-1	1.0

Remark:

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

² Direction of standard

³ Direction of Unit Under Calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No.: CDT-037-66
Page 1 of 2

Equipment Name: Data Logger with Temperature sensor
Manufacturer: Novolynx
Model: 110-WS-25DL-D
Serial No.: A5662
ID No.: RYG_FS0544

Customer
Name: ALS laboratory group (Thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 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-100 A500,
Serial No.: 667682-09, 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±3)°C
Relative Humidity: (55±15)%

Calibration Procedure
The temperature calibration was done by In-House
calibration method as WI-CL-001 according to
comparison method with standard digital temperature
indicator and standard temperature probe. The
temperature scale use 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-0038-23, Certificate number: ER-0092-
22

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

Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved Signatory: _____
Mr. Parinya Booncharoen
Calibration Department Manager

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

Function:

This equipment was connected with temperature sensor Model: HMP60 S/N: T2320591.

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	0.099
70	25.054	24.6	-0.5	0.099
70	30.050	29.7	-0.3	0.14
70	35.043	34.5	-0.5	0.099
70	40.036	39.5	-0.5	0.14

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 ★



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

CERTIFICATE OF CALIBRATION

Calibration No.: RH-01072023
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger
Manufacturer : Novolynx
Model/Type : 110-WS-25DL-D
Serial Number : A5662
ID No. : RYG_FS0544
Customer : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan 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±15)%.

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 traceability through National Institute of
Standards and Technology to the international system of units (SI) via M3 Calibration, Inc. Certificate number: 2U020-
001. 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 (LFI) on display. Model: HMP60, Serial num-
ber: T2320591.

Calibration was performed in the range of 20%RH to 80%RH
The results of calibration are reported in table below.

Determined (%RH)	Standard Reading (%RH)	UUC Reading (%RH)	Error (%RH)	Uncertainty (%RH)
20	20.07	16.3	-3.8	0.51
50	50.23	45.0	-5.2	0.51
80	80.23	73.6	-6.7	0.51

Performed by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol
☐ Miss Ruangrumpai Phoommit



Approved Signatory: _____
Mr. Parinya Booncharoen
Calibration Department Manager

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

CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date : 10-Jun-24
Next Cal. Date : 10-Jan-25

Barometric Pressure (mmHg) : 749.1
Relative Humidity (%) : 46.2
Temperature (°C) : 33.8

Console Control Meter Data

Calibration No. : C-100724-BKH_F50556
Dry Gas Meter ID : BKH_F50556
Serial No. : 1606041
Model No. : XD-572-V

Reference Dry Gas Meter Data

Reference Dry Gas Meter ID : BKH_F51122
Serial No. : A2003240
Correction Factor (Y) : 0.9634
Next Calibration Date : 7-Mar-24

ΔH (mm.Hg)	Minutes	Reference Dry Gas Meter Calibration						Console Control : Drygas Meter						Dry Gas Meter Calibration		Office Calibration Factor
		W (liters)			T (°C)			W (liters)			T (°C)			Avg. Tm (°C)	Factor	
		Final	Initial	Total	20	25	30	Final	Initial	Total	20	25	30			
15	11.75	150.00	0.00	150.00	29.0	303546.0	303400.0	146.00	30.0	30.0	30.0	30.0	30.0	0.9675	43.5568	
25	9.24	150.00	0.00	150.00	29.0	303897.0	303800.0	147.00	30.0	30.0	30.0	30.0	30.0	1.0033	43.5741	
50	8.53	150.00	0.00	150.00	29.0	303846.0	303700.0	146.00	31.0	31.0	31.0	31.0	31.0	0.9674	43.5807	
80	5.19	150.00	0.00	150.00	30.0	303897.0	303800.0	147.00	31.0	31.0	31.0	31.0	31.0	0.9679	44.4416	
120	4.20	150.00	0.00	150.00	30.0	304146.0	304000.0	146.00	31.0	31.0	31.0	31.0	31.0	1.0039	43.5581	
Avg.											0.9684	43.5442				

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

Δmp : Office pressure differential that equals to 21.24 in of air @ 25 C and 760 mm of mercury, mmH2O; tolerance for individual values ± 0.06 from average.

Procedure: 40 CFR 82.6 APP A METH SEC 3.3 & 7

Calibrated by: _____
(Mr. Saket Phasangthai)
RYG Field Service Specialist(s)

Approved by: _____
(Mr. Nitthaporn Jangwanwong)
RYG Field Service Specialist(s)

FORM NO. J-18-03, REVISION NO. 3, 08/05/2015 30 Jun 22

FORM NO : F-06-124 REVISION NO : 0 ISSUE DATE: 25/12/23

Certificate No.: G 660705
Date of issue : 14-Nov-23

Instrument description : Flue Gas Analyzer
Instrument model : Testo 340
Control unit serial no. : -
Instrument serial no. : 63119038
ID no. or control no. : RYG_FS0565
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 3 Pages
Receiving no. : L-233748
Receiving date : 06-Nov-23
Parameter of calibration : Gas Calibration(Oxygen 2.498,10.04,21.02 %vol, Carbon Monoxide 80.14,302,1003 ppm, Nitric Oxide 30.01, 151.5, 322.5 ppm,Sulphur Dioxide 50.36, 100.8, 600.8 ppm)



Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laks, Bangkok 10210

Calibration procedure no. : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-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 Environmental condition.
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 not valid and The results relate only to the items tested/calibrated.
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 13-Nov-23

Kwanchoi K.
Mr. Kwanchoi Khamdang
Calibration Technician

P. Wuttin
Mrs. Nongluck Wongsettee
Technical Manager

FM-CL-09-C Rev.8

Page 1 of 3

Issued Date 26/02/16

Entech Industrial Solution Co.,Ltd.

17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laks, Bangkok 10210 THAILAND Tel: 0-2779-8888 Calibration@entech.co.th
Tax ID : 0105536035591 www.entech.co.th

Certificate No.: G 660705

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O2) 10.04 % Vol	CG-0153-21	Nimr	18-Nov-26
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nimr	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nimr	14-Feb-27
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1003 ppm	2584/23	Linde	10-Sep-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nimr	19-Feb-25
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO2) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO2) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO2) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 22.4 °C Humidity : 67.8 %RH Pressure : 1010.2 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 600 ml/min Gas pressure : 1017.2 mbar

Calibration Results (Before adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.498	2.44	-0.058	0.15
O2 (%Vol)	10.04	9.96	-0.08	0.20
O2 (%Vol)	21.02	21.13	0.11	0.30
CO (ppm)	80.14	86	5.86	3.0
CO (ppm)	302	318	16	6.0
CO (ppm)	1003	1049	46	12
NO (ppm)	30.01	27	-3.01	8.0
NO (ppm)	151.5	148	-3.5	8.0
NO (ppm)	322.5	309	-13.5	12
SO2 (ppm)	50.36	52	1.64	6.0
SO2 (ppm)	100.8	103	2.2	6.0
SO2 (ppm)	600.8	604	3.2	13

FM-CL-09-C Rev.8

Page 2 of 3

Issued Date 26/02/16

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Tax ID : 0105536035591 www.entech.co.th

Certificate No.: G 660705

Calibration Results (After adjustment) (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.498	2.44	-0.058	0.15
O2 (%Vol)	10.04	9.96	-0.08	0.20
O2 (%Vol)	21.02	21.13	0.11	0.30
CO (ppm)	80.14	81	0.86	3.0
CO (ppm)	302	302	0	6.0
CO (ppm)	1003	1001	-2	12
NO (ppm)	30.01	32	1.99	8.0
NO (ppm)	151.5	153	1.5	8.0
NO (ppm)	322.5	319	-3.5	12
SO2 (ppm)	50.36	52	1.64	6.0
SO2 (ppm)	100.8	103	2.2	6.0
SO2 (ppm)	600.8	604	3.2	13

Remark : 1 cmol/mol = 1 %vol, 1 µmol/mol = 1 ppm.

End of Report



CALIBRATION LABORATORY Co.,LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrae, Bangkok 10230
Tel: 02-078-0353-4 Fax: 02-078-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : QUALITYWELL
MODEL / TYPE : N/A
SERIAL NO. : VG02(RYG_FS0333)
CLID. NO. : 212300696
JOB CONTROL NO. : 230329034807



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

DATE OF RECEIVED : 29 March 2023

DATE OF ISSUED : 31 March 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sittipong Pimdee
Calibration Engineer

Sittipong Pimdee

Approved By : Mongkol Yotsontorn
Authorized Signatory
31 March 2023



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23034807

F3-011-04/01-12

page 1 of 3

FM-CL-09-C Rev.8

Page 3 of 3

Issued Date 26/02/16

Entech Industrial Solution Co.,Ltd.

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Tax ID : 0105536035591 www.entech.co.th



@calibrator



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : QUALITYWELL
MODEL / TYPE : N/A
SERIAL NO. : VG02[RYG_FS0333]
DATE OF CALIBRATION : 30 March 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPMP-05 according to DKD-R 6-1 as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Flake Model 741B S/N. 8295020 with Pressure Module Model 700PDS S/N. 89404505.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MP-0035-23, Due Date 02 February 2024.

UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k=2$. It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q23034807

F3-011-04/01-12

page 2 of 3



@calibration

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (inHg)	STD Reading (inHg)		Correction (inHg)	
	Up	Down	Up	Down
-10.0	-9.96	-9.97	+0.04	+0.03
-20.0	-20.11	-20.12	-0.11	-0.12
-26.0	-26.18	-26.19	-0.18	-0.19
-27.0	-27.21	-27.22	-0.21	-0.22
-28.0	-28.30	-28.30	-0.30	-0.30

Uncertainty of measurement ± 0.06 inHg

Transmitting fluid : Air.

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 36 of 54

This report is valid for the above stated instrument's only.

End of Certificate

Certificate No. Q23034807

F3-011-04/01-12

page 3 of 3



@calibration



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR3900
Serial No. (or ID): 2021761 (RYG_EN0179)
Manufacturer: HACH
Condition: In Condition

Certificate No.: C06230442
Issued Date: 22 September 2023
Job No.: WO-00005382
Page: 1 of 3

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

Environment Condition: Temperature 24.1 $^\circ\text{C}$ ± 0.1
Humidity 61.6 $\% \text{RH}$ ± 1.8

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

Calibration By: Mr. Nattapat Rungrueang
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 Starna Scientific Limited.

The standard for Wavelength Certificate No. 111583 and 111584
The standard for Photometric Certificate No. 9114984
The standard for Stray light Certificate No. 111585

(Mr. Nattapat Rungrueang)
Person in charge

(Mr. Nitinun Srihawan)
Authorized signatory

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

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

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

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DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C06-15: 12 Sep 2022



Certificate No.: C06230442

Page 2 of 3

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm). The spectral bandwidth of Std at 5 nm and UUC at 5 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.40	418	0.40	0.59
537.00	536	1.00	0.59
638.00	638	0.00	0.59
747.61	748	-0.39	0.59
807.04	807	0.04	0.59

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2930	0.289	0.0040	0.0045
	0.5168	0.517	-0.0002	0.0045
	1.0298	1.026	0.0038	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2887	0.281	0.0057	0.0045
	0.5073	0.506	0.0013	0.0045
	1.0083	1.003	0.0053	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2516	0.249	0.0026	0.0045
	0.4595	0.461	-0.0015	0.0045
	0.9334	0.933	0.0004	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2461	0.244	0.0021	0.0045
	0.4652	0.466	-0.0008	0.0045
	0.9468	0.945	0.0018	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2594	0.257	0.0024	0.0045
	0.5040	0.504	0.0000	0.0045
	1.0032	1.000	0.0032	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2579	0.256	0.0019	0.0045
	0.4971	0.497	0.0001	0.0045
	0.9720	0.970	0.0020	0.0045

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CAL-FM-C06-15: 12 Sep 2022

Calibration Results:
Without Adjustment

Stray light *	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
Standard: cut-off			
391.44 +/- 0.11 nm	391	3.6	1.444

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

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00005382

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR3900

หมายเลขเครื่อง: 2021761

ตรวจสอบ (รับ)	ตรวจสอบ (ส่ง)	หมายเหตุ
18 Sep 2023	18 Sep 2023	
ปกติ	ปกติ	
ไม่ปกติ	ไม่ปกติ	
General		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1. ความสมบูรณ์เครื่อง
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4. ปุ่มกด (Keypad)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)
Spectrophotometer		
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่ (Battery Backup) >= 2.5 VDC
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวควบคุมความยาวคลื่น (Wavelength Control)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check) 807nm=807.3nm
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)
pH Meter and Conductivity Meter		
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCI)
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันลม Electrode (Dust Protection Hood)
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)
Turbidimeter		
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)
Automatic Burette		
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ

เพิ่มเติมข้อมูล:

Mr.Nattapol Rungreang
Service Engineerบริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
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CAL-FM-G06-15: 12 Sep 2022

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CAL-FM-R31-03: 20 Jul 2022



DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date : 10-Jul-24 Barometric Pressure (mm.Hg) : 749.1
Next Calibration Date : 10-Jan-25 Relative Humidity (%) : 46.2
Temperature (°C) : 33.8

Dry Gas Meter Data

Calibration sheet No. : C-090724-BKK_F50563

Dry Gas Meter ID : BKK_F50563

Serial No. : 1606011

Model No. : XC-62-CV

Reference Dry Gas Meter Data

Reference Dry Gas Meter ID : BKK_F51122

Serial No. : A2003240

Correction Factor (Y) : 0.9824

Next Calibration Date : 7 Nov 24

Reference Dry Gas Meter Calibration				Dry Gas Meter						Dry Gas Meter Correction	
Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg. Tm (°C)	Factor (Y)	
Final	Initial	Total		Final	Initial	Total					
30.00	0.00	30.00	27.0	30.22	0.00	30.22	27.0	27.0	27.0	0.9752	
30.00	0.00	30.00	27.0	30.21	0.00	30.21	27.0	27.0	27.0	0.9756	
60.00	0.00	60.00	27.0	61.11	0.00	61.11	28.0	28.0	27.0	0.9646	
60.00	0.00	60.00	27.0	60.88	0.00	60.88	28.0	28.0	27.0	0.9682	
90.00	0.00	90.00	27.0	90.33	0.00	90.33	28.0	28.0	27.0	0.9798	
90.00	0.00	90.00	27.0	90.22	0.00	90.22	28.0	28.0	27.0	0.9800	
Avg.										0.9737	

Y = Ratio of reading of reference dry gas meter to dry gas meter ; tolerance for individual ± 0.05 from average.

Calibrate by :

Mr. (Jittakorn Sriwasa)
RYG Field Service Scientist (2)

Approved by :

(Mr.Nattapol Jiengwarewong)
RYG Field Service Specialist (1)

FORM NO.: F 06-023 REVISION NO.: 1 ISSUE DATE: 30/6/22



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	10 Jul 24	Ambient Temperature (°C)	33.8
Calibration sheet No. :	C-100724-BKK_F50563	Relative Humidity (%) :	46.2
Digital Temperature ID :	BKK_F50563	Reference Temperature ID	RYG_F50681
Serial No. :	1606011	Serial No. :	201090014918
Model :	XC-62-CV	Model :	Digicon-CC-VT-MS
		Next Calibrate :	13 Nov 24

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
	100	100	0	±3	Pass
	150	150	0	±3	Pass
	200	199	-1	±3	Pass
Probe	250	250	0	±3	Pass
	300	299	-1	±3	Pass
	500	499	-1	±3	Pass
	100	100	0	±3	Pass
	120	119	-1	±3	Pass
	140	139	-1	±3	Pass
Oven					
Filter					
	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	140	0	±3	Pass
Exit	0	0	0	±3	Pass
	10	10	0	±3	Pass
	20	19	-1	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
AUX	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัด

Calibrated by :

Mr. Jittakorn Sriwasa
RYG Field Service Scientist (2)

Approved by :

Mr.Nattapol Jiengwarewong
RYG Field Service Specialist (1)

FORM NO.: F 06-027 REVISION NO.: 2 ISSUE DATE: 9 Feb 23



SARTORIUS

Certificate of Calibration

REVIEW BY: Dr. N. N. N.
APPROVED BY: Dr. N. N. N.
NEXT CAL. DATE: 01/02/2025

Model Number: MSU224S-100-DU Certificate No.: 24BCI0073
Description: Analytical Balance Issued Date: Friday, February 23, 2024
Serial Number: 0031709552 Reference No.: 229196
ID No.: RYG_EN0003
Manufacturer: Sartorius Page No.: 1 of 2

Customer Name: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
618/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.

Calibrated Place: ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)
616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.

Calibrated By: Mr.Chonchai Inthana
Calibration Date: Thursday, February 22, 2024

Calibration Procedure No.: This calibration was conducted by Using in-house calibration procedure number (WI-003) Based on UKAS LAB 14 : 2019

Metrological data :
Capacity: 220 g Readability: 0.0001 g
Ambients Conditions:
Temperature: 23.7 °C ± 5.0 °C
Humidity: 62.0 % RH ± 10.0 % RH
Pressure: ±

Reasons for calibration
☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ Maintenance
Equipment Condition: ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref :Lab 14
The measurement uncertainty stated is the expanded uncertainty which is based on the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2,YCS011-522-00	TCS	M2308197S	23-Aug-2025
MHB-382SD	Humidity/Balometer/Temp Lutron MHB-382SD	DKSH	C1923184S	23-Aug-2024

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

Mr.Chonchai Inthana



SOP FM 33 03 February 2022

Mr.Chonchai Inthana(Technical Manager)

SARTORIUS

Certificate of Calibration

Model Number: MSU224S-100-DU Certificate No.: 24BCI0073
Description: Analytical Balance Issued Date: Friday, February 23, 2024
Serial Number: 0031709552 Reference No.: 229196
ID No.: RYG_EN0003
Manufacturer: Sartorius Page No.: 2 of 2

Calibration Results : Without Adjustment

Repeatability	Eccentricity (Off-center loading error)
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement range is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.	The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/2 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).
Nominal Value : (Low Load) 20 g Tolerance 0.0001 g	Nominal value : 100 g Tolerance 0.0004 g
Nominal Value : (High Load) 200 g Tolerance 0.0001 g	Difference 1 2 3 4 5 6
Standard Deviation 0.00005	0.00005

Linearity

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

Tolerance		0.0002 g		
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.01	0.0100	0.0100	0.0000	0.00013
0.1	0.1000	0.1000	0.0000	0.00013
0.5	0.5000	0.5000	0.0000	0.00013
1	1.0000	1.0000	0.0000	0.00013
5	5.0000	5.0000	0.0000	0.00013
10	10.0000	10.0000	0.0000	0.00013
20	20.0000	20.0000	0.0000	0.00013
50	50.0000	50.0000	0.0000	0.00024
100	100.0000	99.9999	-0.0001	0.00018
200	200.0000	199.9999	-0.0001	0.00029

End of Report.

SOP FM 33 03 February 2022



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0292 MTC No. EEL. BP. 83/0267

CALIBRATION CERTIFICATE

Submitted by: ALS Laboratory Group (Thailand) Co.,Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250.
Calibrated at: Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :
Description: Sound Calibrator
Manufacturer: Rion
Model: NC-74
Serial No.: 34178121 (ID:RYG_FS0213)
Ambient Environment:
Temperature: (23 ± 3) °C
Relative Humidity: (50 ± 15) %
Ambient Pressure: (101.325 ± 1.500) kPa

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 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 insert 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 tested/calibrated 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 TISTR.

FIALB.MTC.002 Rev.5

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0292 MTC No. EEL. BP. 83/0267

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

2. Frequency

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

3. Total Distortion

Standard Microphone	Measured Total Distortion	Uncertainty	Tolerance limit
Type	(%)	(%)	IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.80	± 0.50	±3.0%

Note: 1. No adjustment.

2. The calibrator pressure correction was not included.

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

Calibrated by: Mr.Weerachai Deechaiyae

Approved by: Mr.Pravate Khayap
(Mr.Pravate Khayap)
Director

Date of Calibration : 28 Feb. 2024

Date of Issue : 29 Feb. 2024

End of Certificate

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref: 2011267021900719001

2 / 2

The results relate only to the items tested/calibrated 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 TISTR.

FIALB.MTC.002 Rev.6

Cert. No. : ACL24071
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01222724 / 143486 / 22620
ID No.: RYG_FS0023

Condition As Found : GOOD

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

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

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

Calibrated by : Nathakorn Pisutpaisan

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

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

Cert. No. : ACL24071
Job No. : VC67AC0054
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

Cert. No. : ACL24071
Job No. : VC67AC0054
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 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	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).

Cert. No. : ACL24071
Job No. : VC67AC0054
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)
17.3

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

Frequency Weighting	Measured value (dB)
A - weight	14.8
C - weight	20.6
Flat	26.4

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	1.4	1.5	1.5	±5.0

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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



Cert. No. : ACL24071
Job No. : VC67AC0054
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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

7. Petch.

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



Cert. No. : ACL24071
Job No. : VC67AC0054
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-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

7. Petch.

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



Cert. No. : ACL24071
Job No. : VC67AC0054
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.9	-0.5	±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

7. Petch.

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CALIBRATION LABORATORY

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



Cert. No. : ACL24071
Job No. : VC67AC0054
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

7. Petch.

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_FS0025

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAENG 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 : 25-26 JANUARY 2024
Date of Issue : 29 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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

Cert. No. : ACL24091
Job No. : VC67AC0058
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

Cert. No. : ACL24091
Job No. : VC67AC0058
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 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31/0266	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).

Cert. No. : ACL24091
Job No. : VC67AC0058
Pages : 3 of 8Cert. No. : ACL24091
Job No. : VC67AC0058
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)
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

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

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

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

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

T. Petch.

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

10. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±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. Petch.

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

T. Petch.



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 176/0167

CALIBRATION CERTIFICATE

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
Address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter
Manufacturer : Rion
Model : NL-42
Serial No. : 00900071 (ID:RYG_FS0492)
Microphone : UC-52 No.188464
Preamplifier : NH-24 No.01733

Ambient Environment

Temperature : (23 ± 3) °C
Relative Humidity : (50 ± 15) %
Ambient Pressure : (101.325 ± 1.5) kPa



Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AI-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 24 Jan. 2024

Date of Calibration : 23 Feb.2024-1 Mar.2024

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.94	113.7	113.9	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 124.2 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
17.3	0.10	N/A

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

Frequency Weighing	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	12.4	0.10	N/A
C-Weight	18.1	0.10	N/A
Flat	23.9	0.10	N/A

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9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the 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.

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%.

Date of Calibration : 23 Feb.2024-1 Mar.2024

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.1	0.2	0.2	1.5	0.45	0.6
1 000	-0.1	-0.1	-0.1	1.0	0.45	0.6
8 000	0.3	0.3	0.2	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	-0.1	0.0	0.0	2.0	0.20	0.6
125	0.0	0.0	0.0	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	0.0	0.0	0.0	2.0	0.20	0.6
4 000	0.0	0.0	0.0	3.0	0.20	0.6
8 000	0.0	0.0	0.0	5.0	0.20	0.7

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5. Long-term stability

Time	Measured Value	Deviated value	Acceptance limit	Uncertainty	Maximum-permitted
	(dB)	(dB)	class 2		uncertainty of measurement
			(±dB)	(±dB)	(±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency	Measured value	Deviated value	Acceptance limit	Uncertainty	Maximum-permitted
Weighting	(dB)	(dB)	class 2		uncertainty of measurement
			(±dB)	(±dB)	(±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency	Measured value	Deviated value	Acceptance limit	Uncertainty	Maximum-permitted
Weighting	(dB)	(dB)	class 2		uncertainty of measurement
			(±dB)	(±dB)	(±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

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7. Level linearity on the reference level range (cont.)

Anticipated	Measured value	Deviated value	Acceptance limit	Uncertainty	Maximum-permitted
value	(dB)	(dB)	class 2		uncertainty of measurement
(dB)			(±dB)	(±dB)	(±dB)
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3
34	33.9	-0.1	1.1	0.30	0.3
29	28.9	-0.1	1.1	0.30	0.3
28	27.9	-0.1	1.1	0.30	0.3
27	26.9	-0.1	1.1	0.30	0.3
26	25.9	-0.1	1.1	0.30	0.3
25	24.8	-0.2	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value	Measured value	Deviated	Acceptance	Uncertainty	Maximum-permitted
	(dB)	(dB)	value	limit class 2		uncertainty of measurement
			(dB)	(±dB)	(±dB)	(±dB)
30-130	94.0	94.0	0.0	1.1	0.30	0.3

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7. Level linearity on the reference level range

Anticipated	Measured value	Deviated value	Acceptance limit	Uncertainty	Maximum-permitted
value	(dB)	(dB)	class 2		uncertainty of measurement
(dB)			(±dB)	(±dB)	(±dB)
136	136.0	0.0	1.1	0.30	0.3
135	135.0	0.0	1.1	0.30	0.3
134	134.0	0.0	1.1	0.30	0.3
133	133.0	0.0	1.1	0.30	0.3
132	132.0	0.0	1.1	0.30	0.3
131	131.0	0.0	1.1	0.30	0.3
130	130.0	0.0	1.1	0.30	0.3
129	129.0	0.0	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.1	0.1	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3

Date of Calibration : 23 Feb.2024-1 Mar.2024

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value	Measured value	Deviated	Acceptance	Uncertainty	Maximum-permitted
	(dB)	(dB)	value	limit class 2		uncertainty of measurement
			(dB)	(±dB)	(±dB)	(±dB)
30-130	35.0	35.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time	Toneburst	Measured value	Deviated	Acceptance	Uncertainty	Maximum-permitted
Weighting	Duration, Tb	(dB)	value	limit class 2		uncertainty of measurement
	(ms)		(dB)	(±dB)	(±dB)	(±dB)
Fast	200	126.0	0.0	±1.0	0.20	0.3
	2	108.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	99.9	-0.1	+1.5; -5.0	0.20	0.3
Slow	200	119.6	0.0	±1.0	0.20	0.3
	2	100.0	0.0	+1.0; -5.0	0.20	0.3
SEL	200	120.0	0.0	±1.0	0.20	0.3
	2	100.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	90.8	-0.2	+1.5; -5.0	0.20	0.3

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0232

MTC No. EEL. BP. 176/0167

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.2	-0.2	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value	Acceptance limit class 2	Uncertainty	Maximum-permitted uncertainty of measurement
Positive one-half cycle	Negative one-half cycle	(dB)	(±dB)	(±dB)	(±dB)
135.0	135.0	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :

Approved by :

(Mr. Tawikiat Iamsamran)

(Mr. Prawat Klayapa)

Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 23 Feb.2024-1 Mar.2024

Date of Issue : 1 Mar. 2024

Ref : 2011267012400347006

End of Certificate

9 / 9

The results relate only to the items tested/calibrated 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 TISTR.

FIABL.MTC.002 Rev.4

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SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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Cert. No. : ACL24008
Job No. : VC67AC0044
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 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220976	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	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).

T. Petchurai

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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Cert. No. : ACL24008
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 01173610 / 143485 / 22619
ID No. : RYG_FS0389

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAENG 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 DECEMBER 2023
Calibration Date : 05-08 JANUARY 2024
Date of Issue : 09 JANUARY 2024



Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petchurai
(Thanakul Petchurai)

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SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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Cert. No. : ACL24008
Job No. : VC67AC0044
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Uncertainty	Maximum-permitted
	(dB)	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

T. Petchurai

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)
18.6

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

Frequency Weighting	Measured value (dB)
A - weight	16.2
C - weight	22.1
Flat	28.0

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.5	0.5	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.5	0.5	0.6	±5.0

T. Petch.

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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.

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	79.1	0.1	± 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	34.1	0.1	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.2	0.2	± 1.1
27.0	27.4	0.4	± 1.1
26.0	26.3	0.3	± 1.1
25.0	25.4	0.4	± 1.1

T. Petch.

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.7	-0.7	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±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. Petch.

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Cert. No. : ACL24008
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

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 / Preamplifier NH-24
Serial No.: 00873057 / 171591 / 73333
ID No.: RYG_FS0381

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 : 11 OCTOBER 2023
Calibration Date : 19-20 OCTOBER 2023
Date of Issue : 24 OCTOBER 2023

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	19/10/24

Calibrated by : Nathakorn Pisutpaisan

Approved by : *[Signature]*
(Thanakul Petchurai)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
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 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	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).

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
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

QF-TS12-04-04-020664

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)
15.8

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	18.2
Flat	24.0

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.5	0.6	0.6	±5.0

QF-TS12-04-04-020664

T. Petch.

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
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. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 6 of 8

7. Level linearity on the reference level range

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

QF-TS12-04-04-020664

T. Petch.

Continuation of Calibration Certificate

Cert. No. : ACL23323
Job No. : VC67AC0011
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.75	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

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

QF-TS12-04-04-020664

T. Petch.

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

451-451/1 Sirinthorn Road, Bangbunmu, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.comCert. No. : ACC24008
Job No. : VC67AC0058
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-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL_BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 30/0267	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL_BP 31/0266	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
Audio Analyzer	AVR-3360A	V744B6069	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).

451-451/1 Sirinthorn Road, Bangbunmu, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.comCert. No. : ACC24008
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-75
Serial No. : 35002736
ID No. : RYG_FS0496

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAENG 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 : Nathakorn Pisutpaisan

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

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

451-451/1 Sirinthorn Road, Bangbunmu, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.comCert. No. : ACC24008
Job No. : VC67AC0058
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	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

Cert. No. : ACL24090
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233183 / 144835 / 23230
ID No.: RYG_FS0024

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHAENG 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 : 25-26 JANUARY 2024
Date of Issue : 29 JANUARY 2024



Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(Thanakul Petchurai)

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

Cert. No. : ACL24090
Job No. : VC67AC0058
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

Cert. No. : ACL24090
Job No. : VC67AC0058
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 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL_BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL_BP 31/0266	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).

Cert. No. : ACL24090
Job No. : VC67AC0058
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)
18.3

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	20.0
Flat	25.6

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	0.3	0.3	0.3	±5.0

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
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.

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	74.1	0.1	± 1.1
69.0	69.0	0.0	± 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	34.1	0.1	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.2	0.2	± 1.1
28.0	28.3	0.3	± 1.1
27.0	27.3	0.3	± 1.1
26.0	26.4	0.4	± 1.1
25.0	25.4	0.4	± 1.1

T. Petch.

8. Level linearity including the level range control

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	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	135.7	-0.7	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±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. Petch.

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. Petch.

Cert. No. : ACL24074
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122607 / 145554 / 34373
ID No.: RYG_FS0019

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

Calibrated by : Nathakorn Pisutpaisan

Approved by : *[Signature]*
(Thanakul Petchurai)

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

Cert. No. : ACL24074
Job No. : VC67AC0054
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

Cert. No. : ACL24074
Job No. : VC67AC0054
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 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL-BP 31/0266	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).

Cert. No. : ACL24074
Job No. : VC67AC0054
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)
17.0

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	17.0
Flat	22.7

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.4	-1.4	-1.3	±5.0

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	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.1	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	94.1	0.1	± 0.3

7. Reten.

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	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

7. Reten.

8. Level linearity including the level range control

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -3.0
	200	800	127.6	127.6	0.0	±1.0
	2	8	108.0	108.0	0.0	1.5 ; -3.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.7	-0.7	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

7. Reten.

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

7. Reten.

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-023-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 22016387
ID NUMBER : RYG_F50577
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwang Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 11 Jan 2024
MEASUREMENT DATE : 15 Jan 2024
ISSUE DATE : 17 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The temperature calibration was done by In-House calibration method as WH-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use 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-0038-23, Certificate number: ER-0101-23

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 AS00, Serial No.: 667682-09,
Due date: 28 Mar 2024
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 Sep 2024

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'

REVIEW BY: *Prasanna P.*
APPROVED BY: *[Signature]*
NEXT CAL. DATE: 14/11/25



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22025572.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.060	19.9	-0.2	0.099
80	25.051	24.9	-0.2	0.099
80	30.042	29.9	-0.1	0.099
80	35.035	34.9	-0.1	0.099
80	40.025	39.9	-0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001243.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.060	20.0	-0.1	0.099
110	25.051	25.0	-0.1	0.099
110	30.042	30.0	0.0	0.099
110	35.035	35.0	0.0	0.099
110	40.025	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025042.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.060	20.0	-0.1	0.099
75	25.051	24.9	-0.2	0.099
75	30.042	29.8	-0.2	0.099
75	35.035	34.7	-0.3	0.099
75	40.025	39.7	-0.3	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration



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

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-143-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 22016389
ID NUMBER : RYG_F50579
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwang Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 19 Jul 2024
MEASUREMENT DATE : 06 Aug 2024
ISSUE DATE : 07 Aug 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The temperature calibration was done by In-House calibration method as WH-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use 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-0047-24, Certificate number: ER-0201-23

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 AS00, Serial No.: 667682-09,
Due date: 28 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 Sep 2024

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'

REVIEW BY: *Prasanna P.*
APPROVED BY: *[Signature]*
NEXT CAL. DATE: 6/8/25



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22015701.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.060	20.0	-0.1	0.099
80	25.053	25.0	-0.1	0.099
80	30.048	30.0	0.0	0.099
80	35.038	34.9	-0.1	0.099
80	40.029	39.9	-0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023934.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.060	20.1	0.0	0.099
110	25.052	25.1	0.0	0.099
110	30.048	30.1	0.1	0.099
110	35.037	35.1	0.1	0.099
110	40.029	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025053.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.060	20.2	0.1	0.099
75	25.052	25.1	0.0	0.099
75	30.048	30.0	0.0	0.099
75	35.038	35.0	0.0	0.099
75	40.029	39.9	-0.1	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration



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IN WRITING FROM THE LABORATORY

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-018-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 18018311
ID NUMBER : RYG_F30356
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 11 Jan 2024
MEASUREMENT DATE : 12 Jan 2024
ISSUE DATE : 17 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The temperature calibration was done by In-House calibration method as W-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use 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-0039-23, Certificate number: ER-0101-23

Reference Used During Calibration:

1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09,
Due date: 28 Mar 2024
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 673407-
00591 Due date: 14 Sep 2024

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".

REVIEW BY: *Manon P*
APPROVED BY: *[Signature]*
NEXT CAL. DATE: 11/1/25



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Calibrated by:
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol
☐ Miss Ruangrumpal Phoommit

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Continuation of Certificate of Calibration Number CDT-018-67

Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 18021466.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.053	20.0	-0.1	0.099
80	25.045	25.0	0.0	0.099
80	30.040	30.0	0.0	0.099
80	35.039	35.0	0.0	0.099
80	40.030	40.0	0.0	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 18020493.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.052	20.0	0.0	0.14
110	25.045	25.1	0.1	0.099
110	30.040	30.1	0.1	0.099
110	35.039	35.1	0.1	0.099
110	40.030	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 18021258.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.053	20.2	0.1	0.099
75	25.045	25.0	0.0	0.099
75	30.040	30.0	0.0	0.099
75	35.039	34.9	-0.1	0.099
75	40.030	39.9	-0.1	0.099

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.14, based on standard uncertainty multiplied by a coverage factor k=2.14 providing a level of confidence of approximately 95%

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No. : CDT-029-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 20032241
ID NUMBER : RYG_F50521
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 24 Jan 2024
MEASUREMENT DATE : 25 Jan 2024
ISSUE DATE : 30 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

Calibration procedure:
The temperature calibration was done by In-House calibration method as W-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use 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-0039-23, Certificate number: ER-0101-23

Reference Used During Calibration:

1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09,
Due date: 28 Mar 2024
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 673407-
00591 Due date: 14 Sep 2024

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".

REVIEW BY: *Manon P*
APPROVED BY: *[Signature]*
NEXT CAL. DATE: 30/1/25



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Calibrated by:
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol
☐ Miss Ruangrumpal Phoommit

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Continuation of Certificate of Calibration Number CDT-029-67

Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001217.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.052	20.1	0.0	0.099
80	25.054	25.1	0.0	0.099
80	30.047	30.1	0.1	0.099
80	35.041	35.1	0.1	0.099
80	40.035	40.1	0.1	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001242.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.052	20.0	-0.1	0.099
110	25.055	25.0	-0.1	0.099
110	30.047	30.0	0.0	0.099
110	35.041	35.0	0.0	0.099
110	40.035	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001783.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.052	20.1	0.0	0.099
75	25.054	25.1	0.0	0.099
75	30.047	30.0	0.0	0.099
75	35.041	34.9	-0.1	0.099
75	40.035	39.8	-0.2	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No. : CDT-145-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 22016391
ID NUMBER : RYG_F50581
CONDITION AS-RECEIVED : Used Item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 19 Jul 2024
MEASUREMENT DATE : 07 Aug 2024
ISSUE DATE : 07 Aug 2024

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

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

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

REVIEW BY: *Nasakorn P.*
APPROVED BY: *Nasakorn P.*
NEXT CAL. DATE: 7/8/25

Calibration procedure:
The temperature calibration was done by In-House calibration method by WH-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use 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-0047-24, Certificate number: 0101-23

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 AS500, Serial No.: 667682-05,
Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 Sep 2024

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

Calibrated by:
☐ Mr. Sorawit Thachalad
☒ Miss Jittaporn Lertsomphol
☐ Miss Ruangrumpal Phoommit



Approved signatory: *Nasakorn P.*
Mr. Parinya Booncharoen
Calibration Department Manager

End of Certificate of Calibration



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

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-144-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 22016390
ID NUMBER : RYG_F50580
CONDITION AS-RECEIVED : Used Item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 19 Jul 2024
MEASUREMENT DATE : 07 Aug 2024
ISSUE DATE : 07 Aug 2024

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

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

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

REVIEW BY: *Nasakorn P.*
APPROVED BY: *Nasakorn P.*
NEXT CAL. DATE: 7/8/25

Calibration procedure:
The temperature calibration was done by In-House calibration method by WH-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use 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-0047-24, Certificate number: 0101-23

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 AS500, Serial No.: 667682-05,
Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 Sep 2024

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

Calibrated by:
☐ Mr. Sorawit Thachalad
☒ Miss Jittaporn Lertsomphol
☐ Miss Ruangrumpal Phoommit



Approved signatory: *Nasakorn P.*
Mr. Parinya Booncharoen
Calibration Department Manager

End of Certificate of Calibration



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Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22025583.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.059	19.9	-0.2	0.099
80	25.054	24.9	-0.2	0.099
80	30.044	29.9	-0.1	0.099
80	35.036	34.9	-0.1	0.099
80	40.026	39.8	-0.2	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023943.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.0	0.0	0.16
110	25.054	25.0	0.0	0.16
110	30.044	30.0	0.0	0.099
110	35.036	35.0	0.0	0.099
110	40.026	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025054.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.059	20.0	-0.1	0.099
75	25.054	25.0	-0.1	0.099
75	30.044	29.9	-0.1	0.099
75	35.036	34.9	-0.1	0.099
75	40.026	39.8	-0.2	0.099

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21 providing a level of confidence of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-031-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 20032243
ID NUMBER : RYG_F50523
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 24 Jan 2024
MEASUREMENT DATE : 26 Jan 2024
ISSUE DATE : 30 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 0.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

REVIEW BY : *Manakorn P.*
APPROVED BY : *[Signature]*
NEXT CAL DATE : 25/1/25



Approved signatory:

[Signature]
Mr. Parinya Booncharoen
Calibration Department Manager

Calibrated by:
☐ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol
☒ Miss Ruangrumpal Phoommit

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

Calibration procedure:
The temperature calibration was done by In-House calibration method as W/CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use 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-0038-23, Certificate number: ER-0101-23

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09,
Due date: 28 Mar 2024
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 Sep 2024

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

Continuation of Certificate of Calibration Number CDT-031-67

Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001219.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.056	19.9	-0.1	0.16
80	25.047	25.0	0.0	0.099
80	30.041	30.0	0.0	0.099
80	35.032	35.0	0.0	0.099
80	40.023	40.0	0.0	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023935.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.056	20.1	0.0	0.099
110	25.047	25.1	0.1	0.099
110	30.040	30.1	0.1	0.099
110	35.033	35.0	0.0	0.099
110	40.023	40.0	0.0	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001786.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.056	20.1	0.0	0.099
75	25.047	25.0	0.0	0.099
75	30.040	30.0	0.0	0.099
75	35.033	34.9	-0.1	0.099
75	40.023	39.9	-0.1	0.099

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



Continuation of Certificate of Calibration Number CDT-028-67

Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 ~ 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001213.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.054	20.1	0.0	0.099
80	25.054	25.2	0.1	0.099
80	30.046	30.2	0.2	0.099
80	35.043	35.2	0.2	0.099
80	40.033	40.2	0.2	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001245.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.054	20.1	0.0	0.099
110	25.055	25.1	0.0	0.099
110	30.046	30.1	0.1	0.099
110	35.043	35.1	0.1	0.099
110	40.033	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001785.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.053	20.1	0.0	0.16
75	25.055	25.0	-0.1	0.099
75	30.046	30.0	0.0	0.099
75	35.043	35.0	0.0	0.099
75	40.033	39.9	-0.1	0.099

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No. : CDT-028-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 20032240
ID NUMBER : RYG_F50520
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 24 Jan 2024
MEASUREMENT DATE : 25 Jan 2024
ISSUE DATE : 30 Jan 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 0.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

REVIEW BY : *Manakorn P.*
APPROVED BY : *[Signature]*
NEXT CAL DATE : 24/1/25



Approved signatory:

[Signature]
Mr. Parinya Booncharoen
Calibration Department Manager

Calibrated by:
☐ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol
☒ Miss Ruangrumpal Phoommit

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

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-142-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Heat Stress Monitor
MANUFACTURER : Delta OHM
MODEL/TYPE : HD32.2
SERIAL NUMBER : 22016388
ID NUMBER : RYG_FS0578
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khaewang Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE : 19 Jul 2024
MEASUREMENT DATE : 06 Aug 2024
ISSUE DATE : 07 Aug 2024

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

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

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

Calibration procedure:
The temperature calibration was done by
in-house calibration method (see: JAC-CL-001
according to comparison method with standard
digital temperature indicator and standard
temperature probe. The temperature scale use
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-0047-24, Certificate
number: EN 0101-23

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 AS50, Serial No.: 667682-05,
Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A Mk II, Serial No.: 671407-
00581 Due date: 14 Sep 2024

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"

Calibrated by:
Mr. Sarawut Thachalad
Miss Jittaporn Lertsomphol
Miss Buangrumpai Phoommit



Approved signatory: Mr. Parinya Booncharon
Calibration Department Manager

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22015694.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.059	19.9	-0.2	0.099
80	25.054	24.9	-0.2	0.099
80	30.047	29.9	-0.1	0.099
80	35.036	34.9	-0.1	0.099
80	40.029	39.8	-0.2	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22023956.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.060	20.1	0.0	0.099
110	25.054	25.1	0.0	0.099
110	30.047	30.1	0.1	0.099
110	35.036	35.1	0.1	0.099
110	40.029	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22025031.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.059	20.2	0.1	0.099
75	25.053	25.1	0.0	0.099
75	30.047	30.0	-0.1	0.16
75	35.036	34.9	-0.1	0.099
75	40.029	39.8	-0.2	0.099

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21
providing a level of confidence of approximately 95%.

End of Certificate of Calibration



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



ROTA METER CALIBRATION RESULT JULY 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0577	01 Jul 24	Y = 1.0001x + 0.0433	1.0000
BKK_FS0584	01 Jul 24	Y = 1.0056x - 2.7974	1.0000
BKK_FS0585	02 Jul 24	Y = 1.0315x + 3.0033	0.9998
BKK_FS0587	02 Jul 24	Y = 1.0294x + 0.71	1.0000
BKK_FS0588	01 Jul 24	Y = 0.9751x + 9.8452	0.9999
BKK_FS0591	01 Jul 24	Y = 1.0035x - 8.2303	1.0000
BKK_FS0592	02 Jul 24	Y = 1.002x + 14.273	1.0000
BKK_FS0594	02 Jul 24	Y = 1.0003x + 7.0095	1.0000
BKK_FS0595	01 Jul 24	Y = 1.0871x - 114.97	0.9985
BKK_FS1004	02 Jul 24	Y = 0.9826x + 13.51	0.9999
BKK_FS1005	02 Jul 24	Y = 1.0217x - 0.5833	0.9997
BKK_FS1006	02 Jul 24	Y = 1.148x - 1.0422	0.9981
BKK_FS1007	02 Jul 24	Y = 1.1116x + 3.3558	0.9994
BKK_FS1008	02 Jul 24	Y = 1.1273x + 0.4837	0.9999
BKK_FS1009	01 Jul 24	Y = 1.1044x - 0.8245	1.0000
BKK_FS1017	02 Jul 24	Y = 1.0488x + 2.2027	0.9998
BKK_FS1018	02 Jul 24	Y = 1.0173x - 0.1987	0.9999
BKK_FS1019	02 Jul 24	Y = 1.0022x + 5.619	1.0000
BKK_FS1026	01 Jul 24	Y = 1.072x - 2.4954	1.0000
BKK_FS1027	01 Jul 24	Y = 1.0104x - 4.4788	0.9999
BKK_FS1028	01 Jul 24	Y = 1.0009x - 3.7755	1.0000
BKK_FS1029	01 Jul 24	Y = 1.1118x - 4.4431	0.9985
BKK_FS1030	01 Jul 24	Y = 1.0159x - 6.395	1.0000
BKK_FS1031	01 Jul 24	Y = 0.9973x - 5.3371	0.9999
BKK_FS1039	02 Jul 24	Y = 0.9992x + 9.6833	0.9992
BKK_FS1040	01 Jul 24	Y = 1.0034x - 2.5343	1.0000
BKK_FS1041	02 Jul 24	Y = 1.0511x + 1.1272	0.9998
BKK_FS1042	02 Jul 24	Y = 1.0016x + 10.387	0.9995
BKK_FS1043	01 Jul 24	Y = 0.9985x + 9.3743	1.0000
BKK_FS1044	02 Jul 24	Y = 1.1237x - 0.4231	0.9981
BKK_FS1200	01 Jul 24	Y = 1.0337x - 0.1016	0.9994
BKK_FS1201	01 Jul 24	Y = 0.9871x + 5.0931	0.9988
BKK_FS1202	01 Jul 24	Y = 0.7978x + 301.39	0.9334
PHK_FS0027	02 Jul 24	Y = 1.0722x + 3.4395	0.9988
PHK_FS0028	02 Jul 24	Y = 1.0254x + 1.04	1.0000
PHK_FS0029	02 Jul 24	Y = 0.999x + 12.73	1.0000
RYG_FS0197	01 Jul 24	Y = 1.0045x + 10.291	1.0000
RYG_FS0198	01 Jul 24	Y = 1.0056x + 1.8883	1.0000
RYG_FS0199	02 Jul 24	Y = 1.0029x + 3.2381	0.9990



ROTA METER CALIBRATION RESULT JULY 2024

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
RYG_FS0654	02 Jul 24	Y = 1.0421x + 1.4935	1.0000
RYG_FS0655	02 Jul 24	Y = 0.975x + 15.2	0.9994
RYG_FS0656	01 Jul 24	Y = 1.0042x + 7.1067	0.9999
RYG_FS0657	02 Jul 24	Y = 1.0337x + 1.8918	0.9998
RYG_FS0658	02 Jul 24	Y = 0.9921x + 10.87	0.9996
RYG_FS0659	01 Jul 24	Y = 1.0022x + 8.4152	1.0000
SGK_FS0135	02 Jul 24	Y = 1.0193x + 3.6833	0.9999
SGK_FS0136	02 Jul 24	Y = 1.0217x + 1.63	1.0000
SGK_FS0138	02 Jul 24	Y = 1.055x + 4.5833	0.9999
SGK_FS0139	02 Jul 24	Y = 1.0154x + 3.74	0.9998
SGK_FS0140	02 Jul 24	Y = 1.0008x + 13.353	1.0000
SGK_FS0141	02 Jul 24	Y = 1.1185x + 1.4867	0.9998
SGK_FS0142	02 Jul 24	Y = 1.0211x + 1.39	1.0000
SGK_FS0143	02 Jul 24	Y = 1.0045x + 5.6981	1.0000

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

Approved By : (Mr. Sarawut Jitranont)
Assistant General Manager

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok
10250

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Bios

Model : Defender 510-L

Serial Number : 206895

ID : BKK_FS1346

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 3 January 2024

Calibration Date : 29 January 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	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/051882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

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

This Certificate was issued to replace to Calibration Certificate No. 24-AFM-018

Calibration By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 1 February 2024

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

FM-708-AFM-01 Rev.01 Issue date 25/01/24

Certificate No : 24-AFM-018 Rev.1

Request No : Req-2024-0043

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (ml/min)	UUC (ml/min)	Error (ml/min)	Uncertainty (ml/min)
25.00	101.66	20	20.148	0.1	1.3
25.00	101.67	100	99.409	-0.6	2.8
24.90	101.63	199	197.46	-1.5	5.6
25.00	101.61	300	298.15	-1.8	8.4
24.90	101.60	399	400.13	1	11
24.90	101.59	480	478.02	-2.0	6.8

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 :

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

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

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 Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.01 Issue date 25/01/24

BKK_FS0614



Calibration Certificate

Certificate No. 610583
Product 200-510M Defender 510 Medium Flow
Serial No. 151114
Cal. Date 21-May-2024

Sold To:

All calibrations are performed in accordance with ISO 17025 at Mesa Laboratories, Inc., 12100 W. 6th Ave, Lakewood, CO 80228, an ISO 17025:2017 accredited laboratory through NVLAP. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

As Received Calibration Data

Technician	Derek Dellape	Lab. Pressure Lab. Temperature	614.2 mmHg 24.3 °C
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation
0 ccm	4504.81 ccm	-100.0%	1.00%
0 ccm	1000.98 ccm	-100.0%	1.00%
0 ccm	249.55 ccm	-100.0%	1.00%

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	117991	13-Nov-2023	13-Nov-2024

As Shipped Calibration Data

Certificate No	610583	Lab. Pressure	617 mmHg
Technician	Derek Dellape	Lab. Temperature	24.6 °C
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation
4482.47 ccm	4493.49 ccm	-0.25%	1.00%
997.25 ccm	996.83 ccm	0.04%	1.00%
248.51 ccm	248.67 ccm	-0.06%	1.00%

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	211063	04-Oct-2023	04-Oct-2024

Calibration Notes

The expanded uncertainty of flow has a coverage factor of $k = 2$ for a confidence interval of approximately 95%.

Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

Technician Notes:

By:

Approved By:

Derek Dellape
Production Assembler II

Troy Thacker
Quality Engineer

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibration process has a Test Uncertainty Ratio (TUR) of 4:1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.



Certificate of Calibration

Customer
Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 24-AFM-033
Request No : Req-2024-0241

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator

Manufacturer : Bios

Model : Defender 510-L

Sensor Model : -

Serial Number : 130027

Sensor Serial Number : -

ID : RYG_FS0208

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 31 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	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qrebon	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024


Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

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. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 13 February 2024

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

FM-708-AFM-01 Rev.01 Issue date 25/01/24

Certificate No : 24-AFM-033
Request No : Req-2024-0241

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.50	101.26	20	19.965	0.0	1.3
24.20	101.25	101	100.50	-0.5	2.8
24.00	101.31	200	199.13	-0.9	5.6
23.90	101.42	301	303.56	2.6	8.4
24.10	101.41	401	404.57	4	11
24.10	101.49	480	483.81	3.8	7.0

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 :

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

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

* Indicates non accredited

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 Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.01 Issue date 25/01/24

Certificate of Calibration

Customer
Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 24-AFM-032
Request No : Req-2024-0240

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator

Manufacturer : Bios

Model : Defender 510-M

Sensor Model : -

Serial Number : 129958

Sensor Serial Number : -

ID : RYG_FS0209

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 31 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	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qrebon	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024


Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

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. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 13 February 2024

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

FM-708-AFM-01 Rev.01 Issue date 25/01/24

Certificate No : 24-AFM-032
Request No : Req-2024-0240

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
23.80	101.89	95	100.13	5.1	2.8
23.90	101.71	501	513.93	12.9	7.2
24.18	101.62	1006	1019.3	13	14
24.00	101.81	1997	2023.0	26	29
24.10	101.87	2999	3035.5	37	45
24.60	102.00	3944	3991.8	48	59
24.60	102.08	4739	4790.5	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 :

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

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

* Indicates non accredited

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 Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.01 Issue date 25/01/24

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phathanakan 40, Phathanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-174

Request No : Req-2024-1861

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : MesaLabs
Model : 510-M
Serial Number : 208345
ID : BKK_FSI347
Location of Calibration : LAB 4 AIR VELOCITY METER

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 22 August 2024
Calibration Date : 28 August 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	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

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 : *h.v.*
Mr. Nopadon Luangari
Service Calibration Engineer

Approved By : *h.v.*
Mr. Pacit Mathavom
Calibration Engineer Supervisor
Issue Date : 28 August 2024

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

FM-708-AFM-01 Rev.04 Issue date 17/6/24

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	500.48	1.5	7.8	5	N/A
22.50	100.56	1004	1004.8	1	15	10	N/A
22.60	100.54	2008	2003.3	-5	29	20	N/A
22.80	100.62	3034	3032.1	-2	45	30	N/A
23.20	100.71	4032	4022.4	-10	60	40	N/A
23.40	100.73	5060	5056.4	-4	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 :

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

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

* Indicates non accredited

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

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 Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

Certificate No : 24-AFM-174

Request No : Req-2024-1861

Decision Rule for Statements of Conformity

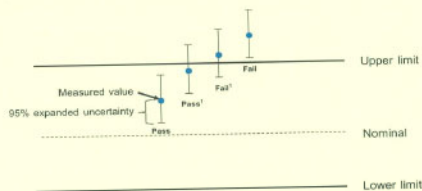
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

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

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

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



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 Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phathanakan 40, Phathanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-177

Request No : Req-2024-1862

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Bios
Model : Defender 510-L
Serial Number : 130026
ID : BKK_FS0619
Location of Calibration : LAB 4 AIR VELOCITY METER

Accuracy : 1% of Reading

Sensor Model : -

Sensor Serial Number : -

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 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	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

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 : *h.v.*
Mr. Nopadon Luangari
Service Calibration Engineer

Approved By : *h.v.*
Mr. Pacit Mathavom
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 Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/6/24

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

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
24.70	100.92	20	20.192	0.2	1.3	0.2	N/A
24.70	100.90	100	99.923	-0.1	2.8	1.0	N/A
24.70	100.94	201	200.7	-0.3	5.6	2.0	N/A
24.70	100.97	298	300.1	2.1	8.4	3.0	N/A
24.70	100.99	403	399.1	-4	11	4.0	N/A
24.80	101.05	482	477.6	-4.4	6.9	4.8	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 :

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

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

* Indicates non accredited

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

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 Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/5/24

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

Decision Rule for Statements of Conformity

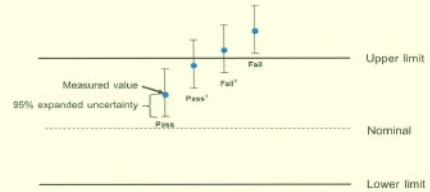
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09-2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

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

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

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



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 Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.04 Issue date 17/5/24

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8301-5, e-mail: service.thailand@sartorius.com



SARTORIUS

Certificate of Calibration

REVIEW BY: *Thamit*
APPROVED BY: *Dek*
NEXT CAL. DATE: 02/02/2025

Model Number : MSE125P-100-DU Certificate No. : 24BC0071
Description : Semi-micro Balance Issued Date : Friday, February 23, 2024
Serial Number : 0033108993 Reference No. : 229196
ID No. : RYG_EN0004
Manufacturer : Sartorius Page No. : 1 of 3

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

Calibrated Place : ALS Laboratory Group (Thailand) Co., Ltd. (Balance Room)
616/10 Moo 5 T.Maenam Khu, A.Pluak Daeng, Rayong 21140, Thailand.

Calibrated By : Mr.Chonchai Inthana
Calibration Date : Thursday, February 22, 2024
Calibration Procedure No. : This calibration was conducted by
Using in-house calibration procedure number (WI-003)
Based on UKAS LAB 14 : 2019

Metrological data :
Capacity : 60./120. g Readability : 0.00001/0.0001 g
Ambients Conditions:
Temperature : 24.0 °C ± 5.0 °C
Humidity : 60.0 % RH ± 10.0 % RH
Pressure : ±

Reasons for calibration
☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ Maintenance
Equipment Condition: ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref :Lab 14
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2,YCS011-522-00	TCS	M2308197S	23-Aug-2025
MHB-382SD	Humidity/Barometer/Temp. Lutron MHB-382SD	DKSH	C19231845	23-Aug-2024

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

Mr.chonchai Inthana(Technical Manager)



SOP FM 33 03 February 2022

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8301-5 Fax: +66 2643-8307, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number : MSE125P-100-DU Certificate No. : 24BC0071
Description : Semi-micro Balance Issued Date : Friday, February 23, 2024
Serial Number : 0033108993 Reference No. : 229196
ID No. : RYG_EN0004
Manufacturer : Sartorius Page No. : 2 of 3

Calibration Results : Without Adjustment

Repeatability	Eccentricity (Off-center loading error)
The reproducibility is the ability of a weighing instrument to display nearly identical results under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.	The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).
Nominal Value : (Low Load) 5 g Tolerance 0.000015 g	Nominal value : 50 g Tolerance 0.00015 g
Nominal Value : (High Load) 50 g Tolerance 0.000015 g	Difference
Standard Deviation 0.000008 0.000005	1 - 2 -0.00001 3 0.00000 4 0.00001 5 0.00001 6 -

Linearity

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

Tolerance 0.00004 g	Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
	0.01	0.01000	0.01000	0.00000	0.000024
	0.1	0.10000	0.10000	0.00000	0.000025
	1	1.00000	1.00000	0.00000	0.000027
	2	2.00002	2.00002	0.00000	0.000028
	5	5.00002	5.00003	0.00001	0.000031
	10	10.00002	10.00004	0.00002	0.000036
	20	20.00002	20.00002	0.00000	0.000049
	30	30.00004	30.00003	-0.00001	0.000089
	40	40.00005	40.00003	-0.00002	0.000089
	50	50.00002	50.00001	-0.00001	0.000089

SOP FM 33 03 February 2022

Certificate of Calibration



REVIEW BY Thirapatt
APPROVED BY [Signature]
NEXT CAL. DATE 02/02/2025

Model Number : MSE12SP-100-DU
Description : Semi-micro Balance
Serial Number : 0033108993
ID No. : RYG_EN0004
Manufacturer : Sartorius

Certificate No. : 24CH1295
Issued Date : Friday, February 23, 2024
Reference No. : 229196

Page No. : 3 of 3

Calibration Results : Without Adjustment

Repeatability			Eccentricity (Off-center loading error)		
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.			The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).		
Nominal Value : (Low Load)		100.0000	Nominal value :	50	g
g		100.0000	Tolerance	0.00015	g
Tolerance		100.0000			
0.000015 g		100.0000			
		100.0000			
		100.0000			
Nominal Value : (High Load)		100.0000			
100 g		100.0001			
Tolerance		100.0000			
0.000015 g		100.0000			
		100.0000			
Standard Deviation		0.00003			

Linearity				
The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.				
Tolerance	0.0001	g		
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
65	65.0000	65.0000	0.0000	0.00015
70	70.0000	70.0000	0.0000	0.00015
75	75.0001	75.0000	-0.0001	0.00015
80	80.0001	80.0000	-0.0001	0.00016
85	85.0001	85.0001	0.0000	0.00018
90	90.0001	90.0001	0.0000	0.00017
95	95.0001	95.0001	0.0000	0.00019
100	100.0000	100.0000	0.0000	0.00024
110	110.0000	110.0000	0.0000	0.00026
120	120.0000	120.0000	0.0000	0.00026

End of Report

SOP FM 33 03 February 2022



Certificate of Calibration

Cert.No.: 24CH1295
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Hach
Model : HQ411d
Serial No. : 200100031163
ID No. : BKK_EN0342
Condition As-Received : Used Item
Received Date : 16 October 2024
Calibration Date : 17 October 2024
Reference : 2410-0548DSC-5
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

REVIEW BY Jinda K
APPROVED BY Siruk P
NEXT CAL DATE 17/10/25

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

Calibrated by : Warakorn Lenggratrakul

Approved by : Sathip
Approved Signatory

() Unnophol Harachai
() Ponpan Paipim
(✓) Sathip Meangmai

Issue Date : 21 October 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



Cert.No.: 24CH1295
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1)Ref. Standard Thermometer	2188080	130RC044	2411022	16 Sep 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

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

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode	4.008	4.028	174.6	0.0044	2.00
S/N.: 230473042902	6.999	7.014	1.4	0.0084	2.05
	10.010	10.018	-172.8	0.0066	2.00

Remark : - Can not connect the BNC because the plug does not match with the socket.



Cert.No.: 24CH1295
Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :	PHC281
- Serial No. :	230473042902
Dimension of probe	
- Length :	103 mm.
- Diameter :	12 mm.
- Immersion Depth :	90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00

Remark : UUC* = Unit Under Calibration

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

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Certificate of Calibration

Cert.No.: 24CH637
Page.: 1 of 2

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C312862891
ID No. : BKK_LG0075
Condition As-Received : Used Item
Received Date : 30 May 2024
Calibration Date : 31 May 2024
Reference : 2405-1027DSC-8
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)

REVIEW BY *Changtham P.*
APPROVED BY *Narakorn P.*
NEXT CAL DATE: 31/05/25

Calibrated by : Walalak Sirinthean

Approved by : *Saithip*
Approved Signatory

() Unnophol Harachai
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 5 June 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



Cert.No.: 24CH637
Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument

Instrument

Serial No.

ID No.

Cert. No.

Due Date

1) Document Process Calibrator

54030049

130RC116

23E2802

27 Aug 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 chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution

Manufacturer

Lot No.

Exp. date

pH 4.008

CPA chem

970851

25 Apr 2026

pH 6.986

CPA chem

970852

25 Apr 2025

pH 9.997

CPA chem

970853

25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: C312862891	4.00	177.48	177	4.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 2484196	4.008	4.01	183	0.0071	2.00
	6.986	6.99	9	0.0093	2.00
	9.997	10.00	-166	0.0085	2.00

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.: 24LM91
Page.: 1 of 2

Equipment : pH Meter with Sensor
Manufacturer : Mettler Toledo
Model : Seven2Go S2
Serial No. : C312862891
ID No. : BKK_LG0075
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 30 May 2024
Calibrated Date : 04 June 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lemagatrakul

Approved by : *Kunchit*
Approved Signatory

() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 7 June 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2405-1027DSC-9

Cert. No.: 24LM91
Page.: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Serial No. Cert. No. Traceable Due Date
1) Digital Thermometer 2188080 231216 TPA 11 Oct 2024

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

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

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 2484196

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	100	20.002	20.2	0.198	0.16	2.00
25.0	100	25.004	25.2	0.196	0.16	2.00
30.0	100	30.004	30.2	0.196	0.16	2.00
35.0	100	35.001	35.2	0.199	0.16	2.00
40.0	100	40.001	40.3	0.299	0.16	2.00
45.0	100	45.002	45.3	0.298	0.16	2.00
50.0	100	50.003	50.3	0.297	0.16	2.00

UUC* : Unit Under Calibration

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

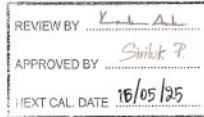
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Cert.No.: 23TW243
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-230V
Serial No. : 09J101147
ID No. : BKK_EN0017
Received Date : 15 November 2023
Test Date : 16 November 2023
Reference : 2311-0505DSC-4
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirthean
Approved by :
(✓) Salthip Meangmai
() Warakorn Lemgagtrakul
() Ponpan Paipim
Issue Date : 17 November 2023



Cert.No.: 23TW243
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 | 1124013382 | 140RC006 | 23MM18 | 20 Feb 2024 |
2. Standard Material :-
- | Material | Manufacturer | Lot.No. | Assay |
|---------------------------------|--------------|-----------|--------|
| Sodium Thiosulfate pentahydrate | Merck | AM1763316 | 100.2% |

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 16K100496

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.18	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.

-00-

B 0328589

a 1190297



Cert. No.: 23LM192
Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-230V
Serial No. : 09J101147
ID No. : BKK_EN0017
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : TPA Chemistry Calibration Laboratory
Received Order : 15 November 2023
Calibrated Date : 16 November 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kunchit Promprut
Approved by :
() Pornthippa Tameyakul
() Ponpan Paipim
(✓) Suwit Imjai
Issue Date : 17 November 2023



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2311-0505DSC-10
Cert. No.: 23LM192
Page.: 2 of 2

Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-
- | Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|------------------------|------------|-----------|-----------|-------------|
| 1) Digital Thermometer | 3240076 | 23I305 | TPA | 15 Mar 2024 |
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 16K100496

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	60	19.997	19.93	-0.067	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 %.

-00-

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0060730

a 1190298



Metrology

SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100
Bangkok Tel : +668 9205 6851 , +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.com



Certificate No. T241495

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Incubator)
Manufacturer : MEMMERT
Model : ICP 750
Serial No. : F818.0033
Customer Code : BKK_EN0272
ID No. : T8041A4
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Wet Chemistry Lab 2
Date of Receipt : 14 August 2024
Calibrated By : Sujjar Naknakred (Site Calibration Manager)
Approved By : [Signature] / Boonchai Suriyawong (Assistant Calibration Manager)
Date of Issue : 27 AUG 2024

REVIEW BY [Signature]
APPROVED BY [Signature]
NEXT CAL DATE 22/08/25

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM-L14 118/18-08-66



Metrology

SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T241495

Page 2 of 4

Calibration Report

Equipment : Chamber (Incubator)
Date of Calibration : 22 August 2024 (Finished Time 11:19 AM)
Environment : Temperature 22.3-23.0 °C
Line Voltage 222.5-227.5 V

Condition of this results of test. :

- This instrument was calibrated by insert 12 standard resistance thermometer into its chamber and test according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986.)
All data show below were final values and the initial data may be obtained upon request.
The temperature scale used was based on ITS - 90.
- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	27-(CH1-10)	T240709	19 April 2025
RTD	100 ohm	28-(CH1-10)	T240709	19 April 2025
DATA LOGGER	34970A	T149	T240709	19 April 2025
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244.)
- Condition of calibrated item : good
UUC Description :
Time Constant 1 Hour 38 Minute At 20 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Result of test :
() without adjustment (X) after adjustment

Approved By [Signature]

FM-L15 118/18-08-66



Metrology

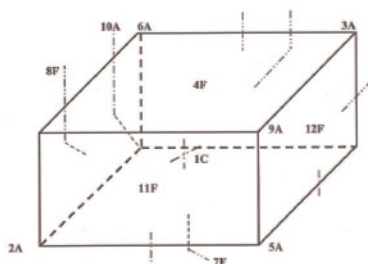
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No T241495

Page 3 of 4

Calibration Report



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

1C = 27-CH1	11F = 28-CH1
2A = 27-CH2	12F = 28-CH2
3A = 27-CH3	
4F = 27-CH4	
5A = 27-CH5	
6A = 27-CH6	
7F = 27-CH7	
8F = 27-CH8	
9A = 27-CH9	
10A = 27-CH10	

Approved By [Signature]

FM-L15 118/18-08-66



Metrology

SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T241495

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	27-CH1	27-CH2	27-CH3	27-CH4	27-CH5	27-CH6	27-CH7	27-CH8	27-CH9	27-CH10
20.0	20.32	20.32	20.29	20.23	20.30	20.34	20.40	20.16	20.34	19.62
	28-CH1	28-CH2								
	19.70	19.65								

Chamber (Incubator)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage
	Min , Max	Average					Factor k
20.0	19.9 , 20.1	20.0	20.01	0.04	0.19	0.38	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

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

Approved By [Signature]

FM-L15 118/18-08-66



Certificate of Calibration

Cert.No.: 24CG952
Page.: 1 of 2

Equipment : Burette
Capacity : 50 mL
Serial No. : -
ID. No. : BKK_EN0171
Manufacturer : Witeg
Made in : Germany
Submitted by :

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

Ambient Temperature : (20 ± 2.5) °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 760 mmHg
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Natcha Chayingcheiw

Approved by :

() Unnophol Harachai
(✓) Srisuda Khamtha
() Sa-ngeunkam Wongsa

Issue Date : 27 February 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



Equipment : Burette
Received Date : 23 February 2024
Condition As-Received : New item
Calibration Date : 27 February 2024
Reference : 2402-0757DSC-1

Cert.No.: 24CG952
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205DR	1126143764	140RC004	23MM538	TPA	15 Sep 2024
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	23H1275	TPA	09 June 2024
3) Thermometer	-	0834181	140EC005	23I948	TPA	10 Aug 2024

This certification is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.
3. True value is converted to true volume at the standard temperature of 20 °C

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
50	50.0032	0.010	2.00

Remark mL = cm³

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

-o0o-



Metrological Center SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T240741

Page 1 of 5

Certificate of Calibration

Equipment : HOT BLOCK
Manufacturer : Environmental Express

Model : B3000- 240

Serial No. : 2017CODW116

Customer Code : BKK_EN0222

ID No. : T6769A4

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

Customer Location : Wet Chemistry Lab2

Date of Receipt : 11 April 2024

Calibrated By : Sane Musikanwan (Site Calibration Manager)

Approved By :  / Sujar Naknakred (Site Calibration Manager)

Date of Issue : 23 APR 2024

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

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

FM-L12 109/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T240741

Page 2 of 5

Calibration Report

Equipment : HOT BLOCK
Date of Calibration : 22 April 2024
Environment : Temperature : 22.9-24.4 °C
Line Voltage : 222.7-227.8 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 20 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986). All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN21-TN30	T240235	17 February 2025
TC	TYPE T	TN31-TN40	T240235	17 February 2025
DATA LOGGER	34970A	T195	T240235	17 February 2025

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour 10 Minute At 150 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment

() after adjustment

Approved By: 

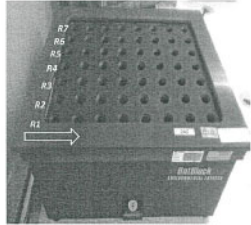
FM-L13 108/30-05-57



Certificate No. T240741

Page 3 of 5

Calibration Report



Row	Hole							
R7	H49	H50	H51	H52	H53	H54	H55	H56
R6	H41	H42	H43	H44	H45	H46	H47	H48
R5	H33	H34	H35	H36	H37	H38	H39	H40
R4	H25	H26	H27	H28	H29	H30	H31	H32
R3	H17	H18	H19	H20	H21	H22	H23	H24
R2	H9	H10	H11	H12	H13	H14	H15	H16
R1	H1	H2	H3	H4	H5	H6	H7	H8

H: STANDARD THERMOCOUPLE TYPE T

H1	=	TN21	H9	=	TN29	H17	=	TN37	H25	=	TN25	H33	=	TN33	H41	=	TN21	H49	=	TN29
H2	=	TN22	H10	=	TN30	H18	=	TN38	H26	=	TN26	H34	=	TN34	H42	=	TN22	H50	=	TN30
H3	=	TN23	H11	=	TN31	H19	=	TN39	H27	=	TN27	H35	=	TN35	H43	=	TN23	H51	=	TN31
H4	=	TN24	H12	=	TN32	H20	=	TN40	H28	=	TN28	H36	=	TN36	H44	=	TN24	H52	=	TN32
H5	=	TN25	H13	=	TN33	H21	=	TN21	H29	=	TN29	H37	=	TN37	H45	=	TN25	H53	=	TN33
H6	=	TN26	H14	=	TN34	H22	=	TN22	H30	=	TN30	H38	=	TN38	H46	=	TN26	H54	=	TN34
H7	=	TN27	H15	=	TN35	H23	=	TN23	H31	=	TN31	H39	=	TN39	H47	=	TN27	H55	=	TN35
H8	=	TN28	H16	=	TN36	H24	=	TN24	H32	=	TN32	H40	=	TN40	H48	=	TN28	H56	=	TN36

Approved By.

FM-L13 108/30-05-57

Certificate No. T240741

Page 4 of 5

Calibration Report

Measurement Results

			Average Standard Reading at each position (°C)																				
Calibration Point			TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30											
Point	Setting	Max	150.38	149.73	150.12	150.36	150.56	150.00	150.48	150.25	150.56	149.59	150.13	149.47	149.87	150.31	149.77	150.25	150.02	149.41	149.41		
150	150.0	Min	150.13	149.47	149.87	150.16	150.31	149.77	150.25	150.02	149.41	149.41	Average	150.23	149.59	149.96	150.24	150.41	149.87	150.36	150.12	150.45	149.51
													TN31	TN32	TN33	TN34	TN35	TN36	TN37	TN38	TN39	TN40	
		Max	150.17	150.28	150.28	150.37	150.09	149.96	149.86	149.75	150.63	150.13	Min	149.94	150.03	150.01	150.18	149.88	149.69	149.68	149.57	150.41	149.96
		Average	150.04	150.14	150.13	150.27	149.98	149.81	149.77	149.65	150.51	150.63	TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30	
		Max	150.28	150.18	149.87	149.57	150.18	149.90	150.59	149.66	150.39	150.08	Min	150.00	149.94	149.67	149.39	149.88	149.58	150.32	149.34	150.11	149.84
		Average	150.14	150.07	149.77	149.49	150.04	149.75	150.48	149.52	150.26	149.97	TN31	TN32	TN33	TN34	TN35	TN36	TN37	TN38	TN39	TN40	
		Max	150.38	149.71	150.18	149.97	150.03	150.05	150.21	150.07	150.02	149.92	Min	150.12	149.49	149.87	149.66	149.71	149.71	149.89	149.79	149.76	149.73
		Average	150.26	149.61	150.04	149.82	149.90	149.89	150.05	149.94	149.91	149.84	TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30	
		Max	150.37	150.20	150.20	150.44	150.67	149.85	150.31	149.90	150.36	149.62	Min	150.11	149.99	150.04	150.26	150.49	149.69	150.12	149.78	150.20	149.40
		Average	150.25	150.12	150.14	150.34	150.57	149.78	150.20	149.83	150.29	149.52	TN31	TN32	TN33	TN34	TN35	TN36					
		Max	150.18	150.02	149.95	150.26	149.92	149.69					Min	150.06	149.88	149.79	150.12	149.80	149.58				
		Average	150.13	149.95	149.89	150.18	149.84	149.64															

Approved By.

FM-L13 108/30-05-57



Certificate No. T240741

Page 5 of 5

Calibration Report

Measurement Results

HOT BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (± °C)	Uncertainty (± °C)
	Min , Max	Average		
150.0	150 , 150.1	150.0	0.20	0.83

The calibration result apply only the above calibrated item.

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

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

Approved By.

FM-L13 108/30-05-57



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Ramat Road
Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375498-7
www.barscientific.com



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-374/24
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11454908533 CD
ID No. BKK_END018
Date of receipt 13 September 2024
Date of calibration 13 September 2024
Date of issue 13 SEP 2024

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

Temperature (25.3 - 26.7) °C (On site)
Humidity (50.4 - 55.0) %RH (On site)

Equipment condition Good Operation

Calibration Location Organic Preparation Lab

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

Traceability Wavelength Accuracy is traceable to certificate No. 106372 and 106371
Photometric Accuracy is traceable to certificate No. 106364 and 111398
Stray Light is traceable to certificate No. 106377
The above certificate are traceable to SI unit through Stama Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Wanchana Janloy

Approved by

Sonthi
Mr.Sonthi Temboonsakdi
Service Manager

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

FM-L13 108/30-05-57



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375498-7
www.barscientific.com



Certificate of Calibration

Certificate No. BSCC-UV-374/24

Number of Page(s) 2 of 3

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
241.70	241.55	-0.15	0.18
334.02	333.85	-0.17	0.18
418.53	418.57	0.04	0.18
572.99	572.97	-0.02	0.18
879.41	879.17	-0.24	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7171	0.7169	-0.0002	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8354	0.8345	-0.0009	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2786	0.2781	-0.0005	0.0075
350	0.0000	0.0000	0.0000	0.0075
	0.6199	0.6194	-0.0005	0.0075

*CNR = Customer not request

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

FM-UV-708-02 Rev.01 (23/01/63)



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375498-7
www.barscientific.com



Certificate of Calibration

Certificate No. BSCC-UV-374/24

Number of Page(s) 3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5761	0.5765	0.0004	0.0042
	0.7119	0.7105	-0.0014	0.0042
	1.0189	1.0174	-0.0015	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5610	0.5613	0.0003	0.0042
	0.7001	0.6984	-0.0017	0.0042
	1.0026	1.0011	-0.0015	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5235	0.5232	-0.0003	0.0042
	0.6614	0.6598	-0.0016	0.0042
	0.9456	0.9444	-0.0012	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5249	0.5245	-0.0004	0.0042
	0.6975	0.6966	-0.0009	0.0042
	1.0009	0.9994	-0.0015	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5590	0.5586	-0.0004	0.0042
	0.7725	0.7708	-0.0017	0.0042
	1.1125	1.1114	-0.0011	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5665	0.5666	0.0000	0.0042
	0.7620	0.7604	-0.0016	0.0042
	1.0882	1.0971	-0.0011	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration (UUC) Wavelength (nm)	Transmission (%)	Absorbance (A)
200.85±0.11nm	199.58	0.9520	2.0217

The Stray Light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

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

End of Certificate

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

FM-UV-708-02 Rev.01 (23/01/63)

Sartorius (Thailand) Co., Ltd.

123 Rama 9 Road, Huayhong, Huayhong, Bangkok 10210
Tel : +66 2604 8351-4, e-mail: service.thailand@sartorius.com



ILAC-MRA
NIST-100-115 17025
CALIBRATION 0426

REVIEW BY *funda K*
APPROVED BY *Siluk P*

NEXT CAL DATE: 02/08/25

Certificate of Calibration

Model Number: MSE2245-100-DU Certificate No.: 24BC0270
Description: Analytical Balance Issued Date: Monday, August 05, 2024
Serial Number: 0027405555 Reference No.: 240942
ID No.: BKC EN0003
Manufacturer: Sartorius Page No.: 1 of 2

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

Calibrated Place: Lab Room

Calibrated By: Mr Chanchai Isthana
Calibration Date: Friday, August 02, 2024

Calibration Procedure No.: This calibration was conducted by
Using in-house calibration procedure number (SM-003)
Based on UKAS LAB 14 : 2019

Metological data:
Capacity: 220 g Readability: 0.0001 g
Ambient Conditions:
Temperature: 23.0 °C ± 5.0 °C
Humidity: 55.0 % RH ± 10.0 % RH
Pressure: ±

Reasons for calibration
☒ New Installation ☐ Service / Repair ☐ Recalibration Maintenance
Equipment Condition: ☒ Good Operate ☐ Fail

Measurement Method UKAS Publication Ref :Lab 14

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1kg - 2000kg YCS011-522-00	NCS	M23081975	23-Aug-2025
Testo 174 H	Thermo-Hygrometer, Testo 174H	ENTECH	WT 661303/H661140	12-Nov-2024

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

Mr.Chanchai Isthana(Technical Manager)



SOP FM 33 03 February 2022

Sartorius (Thailand) Co., Ltd.

123 Rama 9 Road, Huayhong, Huayhong, Bangkok 10210
Tel : +66 2604 8351-4 Fax : +66 2604 8352-7 e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number: MSE2245-100-DU Certificate No.: 24BC0270
Description: Analytical Balance Issued Date: Monday, August 05, 2024
Serial Number: 0027405555 Reference No.: 240942
ID No.: BKC EN0003
Manufacturer: Sartorius Page No.: 2 of 2

Calibration Results : Without Adjustment

Repeatability	Eccentricity (Off-center loading error)
The repeatability is the ability of a weighing instrument to display identical numerical readouts under identical test conditions when the same load within a measurement range is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.	The off-center loading error is pointed by the difference between the readout of the load in 10° or 30° of inclination respectively placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to ISO 916).
Nominal Value : (Low Load) 20 g Tolerance: 0.0001 g	Nominal value: 100 g Tolerance: 0.0004 g
Nominal Value : (High Load) 200 g Tolerance: 0.0001 g	Difference 1 2 3 4 5 6
Standard Deviation 0.00004 0.00006	

Linearity

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

Tolerance 0.0002 g	Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
	0.01	0.0100	0.0100	0.0000	0.00015
	0.1	0.1000	0.1000	0.0000	0.00015
	1	1.0000	1.0000	0.0000	0.00015
	2	2.0000	2.0000	0.0000	0.00015
	5	5.0000	5.0000	0.0000	0.00015
	10	10.0000	10.0000	0.0000	0.00015
	20	20.0000	20.0000	0.0000	0.00015
	50	50.0000	50.0001	0.0001	0.00016
	100	100.0000	100.0001	0.0001	0.00019
	200	200.0000	200.0000	0.0000	0.00029

End of Report

SOP FM 33 03 February 2022



Metrology

SCI ECO Services Company Limited

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

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

Bangkok Tel : +668 9205 6851 , +669 8247 2360

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



NSC-TIS-17025
CALIBRATION 0244

Certificate No. T240904

Page 1 of 3

Certificate of Calibration

Equipment : Chamber (Oven)

Manufacturer : Memmert

Model : UF 450

Serial No. : B717.0531

Customer Code : BKK_EN0273

ID No. : T8042A4

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

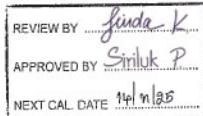
Customer Location : Laboratory (Oven Room)

Date of Receipt : 08 May 2024

Calibrated By : Preecha Phisassutthikul (Temperature Calibration Manager)

Approved By : [Signature] / Nuafun Sungchum (Metrology Manager)

Date of Issue : 23 MAY 2024



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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM-L14 119/18-08-66



Metrology

SCI ECO Services Company Limited

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

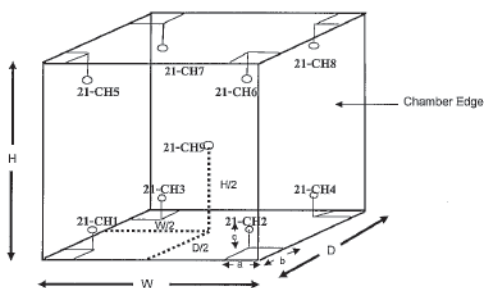


NSC-TIS-17025
CALIBRATION 0244

Certificate No. T240904

Page 3 of 3

Calibration Report



Remark :
Internal Dimensions of Chamber : W (Width) = 104 cm., H (Height) = 72 cm. and D (Depth) = 60 cm.
Size of Installed Standard sensor number 21-CH1 to number 21-CH8 : a = 5 cm., b = 5 cm. and c = 5 cm.
Size of Installed Standard sensor number 21-CH9 : W/2 = 104 cm./2, H/2 = 72 cm./2 and D/2 = 60 cm./2

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	21-CH1	21-CH2	21-CH3	21-CH4	21-CH5	21-CH6	21-CH7	21-CH8	21-CH9	21-CH10
104	103.4	103.9	103.7	103.6	103.3	104.6	103.3	104.0	103.9	
180	179.5	181.1	179.2	179.5	179.0	181.3	179.8	179.9	180.2	

Chamber (Oven)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)	Coverage Factor k
	Min	Max					
104.0	103.9	104	103.85	0.14	1.27	0.44	2.00
180.0	179.9	180.1	179.94	0.39	2.29	0.76	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

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

End of Certificate

Approved By: [Signature]

FM-L15 118/18-08-66



Metrology

SCI ECO Services Company Limited

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



NSC-TIS-17025
CALIBRATION 0244

Certificate No. T240904

Page 2 of 3

Calibration Report

Equipment : Chamber (Oven)

Date of Calibration : 14 May 2024

Environment : Temperature : 26.5-28.1 °C

Line Voltage : 226.7-229.8 V

Relative Humidity : 51 - 57 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986).

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

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	21-(CH1-10)	T231955	17 November 2024
DATA LOGGER	34970A	T121	T231955	17 November 2024

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant	1	Hour	30	Minute	At	104	°C	
Fresh Air Damper	<input type="checkbox"/>	Open	<input type="checkbox"/>	Min	<input type="checkbox"/>	Medium	<input type="checkbox"/>	Max
	<input type="checkbox"/>	Close						
	<input checked="" type="checkbox"/>	Not Available						

5. Adjustment :

(X) without adjustment

() after adjustment

Approved By: [Signature]

FM-L15 118/18-08-66



Metrological Center

SCI ECO Services Company Limited

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

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

Bangkok Tel : +668 9205 6851 , +669 8247 2360

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



NSC-TIS-17025
CALIBRATION 0244

Certificate No. T231303

Page 1 of 3

Certificate of Calibration

Equipment : Liquid Bath (Water)

Manufacturer : MEMMERT

Model : WNB29

Serial No. : L611.0135

Customer Code : BKK_EN0148

ID No. : T6455A4

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

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : ORGANIC PREPARATION LAB

Date of Receipt : 27 June 2023

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

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

Date of Issue : 11 JUL 2023



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

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

FM-L1418/31-08-64



Certificate No. T231303

Page 2 of 3

Calibration Report

Equipment : Liquid Bath (Water)
Date of Calibration : 4 July 2023
Environment : Temperature : 22.2-22.5 °C
Line Voltage : 221.6-224.8 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 (based on ASTM E715-80 (Reapproved 2001)).
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M18 (CH1,CH6-CH7,CH9-CH10)	T230545	10 April 2024
DATA LOGGER	34970A	T149	T230545	10 April 2024

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant 3 Hour 45 Minute At 60 °C

5. Adjustment :

(X) without adjustment () after adjustment

Approved By.

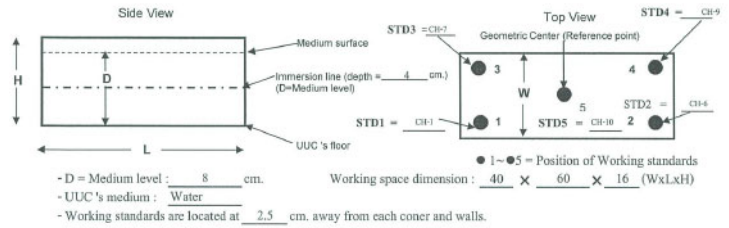
FM-L15 117/15-05-63



Certificate No. T231303

Page 3 of 3

Calibration Report



Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)				
	CH-1	CH-6	CH-7	CH-9	CH-10
60	60.03	60.06	60.24	60.11	60.18
85	84.79	84.83	85.42	85.05	85.20
95	93.71	93.83	94.62	94.15	94.42

Setting (°C)	Liquid Bath (Water)		Temperature Distribution				
	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
61.0	60.9, 61.1	61.0	60.12	0.13	0.19	0.29	2.04
86.0	85.8, 86.2	86.0	85.06	0.19	0.47	0.44	2.17
95.0	94.6, 95	94.9	94.15	0.32	0.65	0.55	2.13

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

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

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

Approved By.

FM-L15 117/15-05-63



Certificate No. T240742

Page 1 of 5

Certificate of Calibration

Equipment : Digestion Unit
Manufacturer : SCP Science
Model : DigiPRER HT
Serial No. : HTC1120480658
Customer Code : BKK_EN0366
ID No. : T2635A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Wet Chemistry Lab 1
Date of Receipt : 11 April 2024
Calibrated By : Sujjar Naknakred (Site Calibration Manager)
Approved By : / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 02 MAY 2024

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

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

FM-L12 109/30-05-57



Certificate No. T240742

Page 2 of 5

Calibration Report

Equipment : Digestion Unit
Date of Calibration : 21 April 2024
Environment : Temperature : 23.9 - 26.3 °C
Line Voltage : 221.8 - 225.9 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert four standard thermocouples type S into its chamber , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T10
was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	Type S	M20A2-(CH11-CH14)	T230886	09 May 2024
DATA LOGGER	34970A	T47	T230886	09 May 2024

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour 6 Minute At 380 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

Approved By.

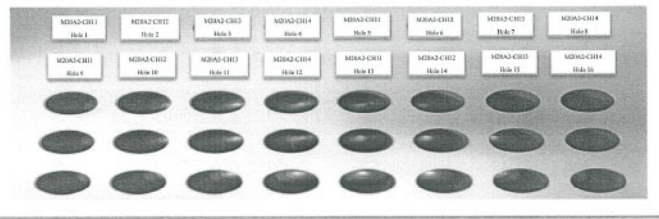
FM-L13 108/30-05-57



Certificate No. T240742

Page 3 of 5

Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	NIST SRM 9000	NIST SRM 9001	NIST SRM 9002	NIST SRM 9003	NIST SRM 9004	NIST SRM 9005	NIST SRM 9006	NIST SRM 9007
380.0	380.0	379.2 - 380.5	Max °C	378.7	378.9	377.9	378.7	380.5	379.8	378.7	377.4
			Min °C	378.2	378.5	377.5	378.2	380.1	379.3	378.3	376.9
			Average °C	378.4	378.7	377.7	378.4	380.3	379.6	378.5	377.2
			Stability ± °C	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2

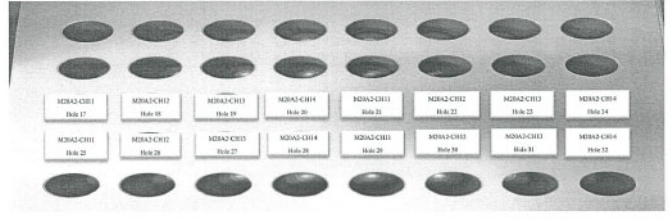
Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	NIST SRM 9000	NIST SRM 9001	NIST SRM 9002	NIST SRM 9003	NIST SRM 9004	NIST SRM 9005	NIST SRM 9006	NIST SRM 9007
380.0	380.0	379.2 - 380.5	Max °C	378.4	378.6	379.2	379.6	381.9	380.6	379.1	378.1
			Min °C	377.8	378.2	378.7	379.2	381.4	379.9	378.3	377.2
			Average °C	378.1	378.4	379.0	379.4	381.6	380.3	378.7	377.7
			Stability ± °C	0.3	0.2	0.2	0.2	0.3	0.4	0.4	0.5

Approved By:

FM-L13 108/30-05-57

Page 4 of 5

Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	NIST SRM 9000	NIST SRM 9001	NIST SRM 9002	NIST SRM 9003	NIST SRM 9004	NIST SRM 9005	NIST SRM 9006	NIST SRM 9007
380.0	380.0	379.2 - 380.5	Max °C	378.9	379.2	378.5	380.1	382.1	381.0	378.9	377.8
			Min °C	378.2	378.6	379.1	379.6	381.7	380.2	378.3	377.2
			Average °C	378.5	378.9	379.3	379.8	381.9	380.6	378.6	377.5
			Stability ± °C	0.3	0.3	0.2	0.2	0.2	0.4	0.3	0.3

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	NIST SRM 9000	NIST SRM 9001	NIST SRM 9002	NIST SRM 9003	NIST SRM 9004	NIST SRM 9005	NIST SRM 9006	NIST SRM 9007
380.0	380.0	379.2 - 380.5	Max °C	378.5	378.1	378.0	378.6	380.7	379.7	377.7	380.9
			Min °C	378.2	377.8	377.7	378.1	380.3	379.0	377.2	380.4
			Average °C	378.4	378.0	377.9	378.4	380.5	379.4	377.5	380.6
			Stability ± °C	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3

Approved By:

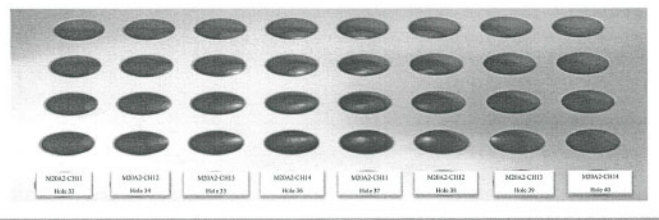
FM-L13 108/30-05-57



Certificate No. T240742

Page 5 of 5

Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	NIST SRM 9000	NIST SRM 9001	NIST SRM 9002	NIST SRM 9003	NIST SRM 9004	NIST SRM 9005	NIST SRM 9006	NIST SRM 9007
380.0	380.0	379.2 - 380.5	Max °C	378.3	377.9	378.7	379.5	381.6	380.5	378.4	378.0
			Min °C	378.0	377.6	378.4	379.1	381.2	380.0	378.1	377.6
			Average °C	378.2	377.8	378.6	379.3	381.4	380.3	378.2	377.8
			Stability ± °C	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

The expanded uncertainty of temperature measurement was ± 1.87 °C

The calibration result apply only the above calibrated item.

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

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

Approved By:

FM-L13 108/30-05-57

Maintenance Plan YEAR : 2024

เดือน	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
รวม												

Periodical maintenance check list for Konelab

	6M	12M	Note!
1.Diluent-wash tubing change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.ISE tubing change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	None
3.Syringe check/change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4.Dispensing check/ change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5.Waste tubing change when necessary	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
6.Lamp check/change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
7.Mixer paddle/paddle change(not Konelab20)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
8.ISE needles check/change	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	None
9.Pump tubing check/ change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
10.Broken/worm out part check /change	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
11.Peristaltic pump check /cleaning/ lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12.Heating check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
13.Cooling check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
14.Dispenser mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
15.Cuvette transfer mechanic check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
16.Dispenser movement check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
17.Sample/reagent register check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
18.Dispensing tubing tightness check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
19.Photometer and optics cleaning/check/adjustment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
20.Workstation PC cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
21.Mechanic cleaning/lubrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
22.Instrument cleaning if necessary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
23.Complete analyzer testing with waterblank/QC or sample	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
24.Test parameters/Adjustment/config. Save to USB key	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
25.UPS Test	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Place: AS LAB Instrument: Konelab
Date/Time: 16/8/22 Serial no: 89271
Service done by: AS LAB Install date: 16/08/2024
Signature of customer: AS LAB Date/Time: 16/08/2024

Accuracy results

Aquakem 7.2.AQ2

Page: 1

Laboratory

Analyzer User

8/16/2024 14:53

Performed

8/16/2024

Lot

WB34

ACCEPTANCE CRITERIA

=====

Result

Limit

Warning

Temperature (°C)

37.8

37.0 +/- 1.0

Dispensing ratio

16.4

14.8 - 17.2

CV%

0.29

<1.7

Photometric noise

Max SD L340_2 (mA)

0.17

<2.0

Max SD L340_4 (mA)

0.87

<3.0

Linearity of photometer

Slope

1.0141

0.94 - 1.06

Curvature

0.0053

+/- 0.02

Max bias from linear fit (mA)

4.3

<15.0

Max delta %

-1.6

+/- 6.0

Linearity of sample dispensing

Proport. volume XDISP2 (?!)

2.06

1.96 - 2.16

Proport. volume XDISP4 (?!)

4.14

3.85 - 4.40

XDISP2 CV%

1.21

<2.0

XDISP4 CV%

0.90

<2.0

XDISP10 CV%

0.68

<2.0

Needle 0 ?l volume

Average (A)

0.005

<0.050

Standard deviation (A)

0.002

<0.005

Volume (?!)

0.03

<0.32

OTHER INFORMATION

=====

Dispensing ratio

Photom. noise: SD (mA)

Posit Result (A)

Posit L340_2

L340_4

1

0.1549

1

0.15

0.80

2

0.1549

2

0.17

0.79

3

0.1537

3

0.04

0.65

4

0.1547

4

0.16

0.31

5

0.1547

5

0.11

0.58

6

0.1545

6

0.14

0.87

Accuracy results

Aquakem 7.2.AQ2

Page: 2

Laboratory

Analyzer User

8/16/2024 14:53

Linearity of sample dispensing

Test Absorbance (A)

XDISP2 0.306

XDISP4 0.612

XDISP10 1.471

Linearity of photometer

L340_ Target (A) Meas (A) Delta (A) Delta %

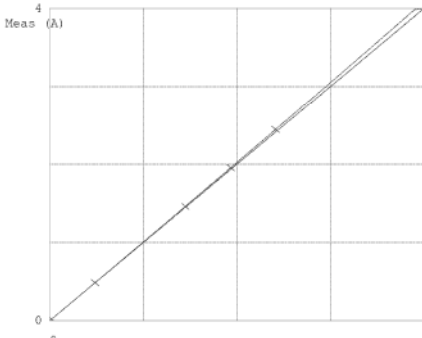
1 0.002 0.006 -0.004 -217.7

2 0.486 0.493 -0.007 -1.5

3 1.451 1.469 -0.018 -1.2

4 1.936 1.963 -0.027 -1.4

5 2.415 2.454 -0.039 -1.6



Meas (A)

0

0

4

Target (A)