

# ภาคผนวก ง

เอกสารการสอบเทียบเครื่องมือตรวจวิเคราะห์



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Total Suspended Particulate	High Volume	BKK_FS0365	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0366	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0368	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0364	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0360	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0364	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0366	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0368	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0365	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0360	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0366	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0368	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS1059	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0359	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BKK_EN0004	8-Feb-23	8-Feb-24	12
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0374	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0375	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS1062	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0380	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0382	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0380	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0375	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS1062	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0374	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0382	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS1062	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0379	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0375	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0389	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	BKK_EN0004	8-Feb-23	8-Feb-24	12
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1090	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1088	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0803	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0794	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0789	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1088	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0803	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0794	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1090	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0789	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1088	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1092	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0803	5-Jan-23	5-Jul-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0782	1-Jul-23	1-Jan-24	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0790	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	RYG_FS0451	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0786	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0742	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS1065	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	RYG_FS0451	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0786	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0731	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0790	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS1065	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0786	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0790	4-Jan-23	4-Jul-23	6



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

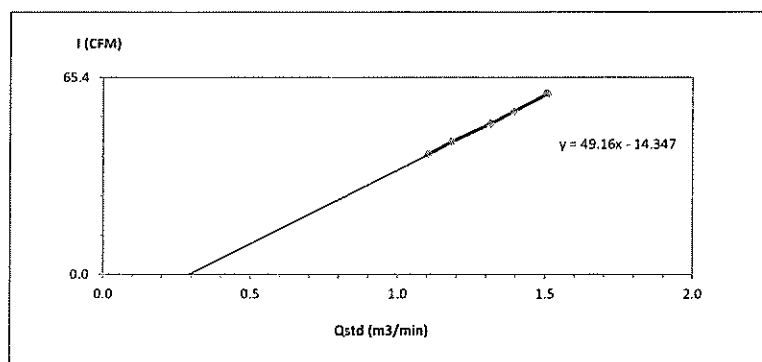
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Carbon Monoxide	CO Analyzer	RYG_FS0451	4-Jan-23	4-Jul-23	6
Ambient	Carbon Monoxide	CO Analyzer	BKK_FS0790	1-Jul-23	1-Jan-24	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0159	23-Nov-22	23-May-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0165	3-May-22	1-Nov-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS1213	17-Nov-22	17-May-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS1212	18-Nov-22	18-May-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0910	10-Dec-22	9-Jun-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS1213	17-Nov-22	17-May-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0165	3-May-22	1-Nov-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS1212	18-Nov-22	18-May-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0159	23-Nov-22	23-May-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0910	10-Dec-22	9-Jun-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0910	10-Dec-22	9-Jun-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0165	3-May-22	1-Nov-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS1212	18-Nov-22	18-May-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS1212	18-Nov-22	18-May-24	18
Noise	Leq 24 hrs	Sound Calibrator	BKK_FS0631	20-Dec-22	20-Dec-23	18
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0106	2-Nov-22	2-Nov-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0111	16-Dec-22	16-Dec-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0117	3-Jan-23	3-Jan-24	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0877	25-Oct-22	25-Oct-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0925	18-Oct-22	18-Oct-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0106	2-Nov-22	2-Nov-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0111	16-Dec-22	16-Dec-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0117	3-Jan-23	3-Jan-24	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0877	25-Oct-22	25-Oct-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0925	18-Oct-22	18-Oct-23	12
Noise	Leq 24 hrs	Sound Calibrator	BKK_FS0631	20-Dec-22	20-Dec-23	18
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0877	25-Oct-22	25-Oct-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0106	2-Nov-22	2-Nov-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0925	18-Oct-22	18-Oct-23	12
Noise	Leq 24 hrs	Sound Calibrator	BKK_FS0618	7-Dec-22	7-Dec-23	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0970	19-Jan-23	19-Jan-24	12
Ambient	Vibration	VIBRATION METER	BKK_FS0857	4-Jan-23	4-Jul-24	18
Ambient	Vibration	VIBRATION METER	BKK_FS0855	16-May-22	16-Nov-23	18
Ambient	Vibration	VIBRATION METER	BKK_FS0858	1-Feb-23	1-Aug-24	18
Ambient	Vibration	VIBRATION METER	BKK_FS0856	25-May-22	25-Nov-23	18
Ambient	Vibration	VIBRATION METER	2342	16-Mar-23	16-Sep-24	18
Ambient	Vibration	VIBRATION METER	BKK_FS0855	16-May-22	16-Nov-23	18
Ambient	Vibration	VIBRATION METER	BKK_FS0858	1-Feb-23	1-Aug-24	18
Ambient	Vibration	VIBRATION METER	BKK_FS0856	25-May-22	25-Nov-23	18
Ambient	Vibration	VIBRATION METER	BKK_FS0857	4-Jan-23	4-Jul-24	18
Ambient	Vibration	VIBRATION METER	2342	16-Mar-23	16-Sep-24	18
Ambient	Vibration	VIBRATION METER	BKK_FS0857	4-Jan-23	4-Jul-24	18
Ambient	Vibration	VIBRATION METER	BKK_FS0856	25-May-22	25-Nov-23	18
Ambient	Vibration	VIBRATION METER	BKK_FS0855	16-May-22	16-Nov-23	18
Ambient	Vibration	VIBRATION METER	BKK_FS0857	4-Jan-23	4-Jul-24	18



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 1 บริเวณขบวนรถไฟฟ้า Temperature (°C) : 35  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS0365  
 CalibrationSheet No.: C-060523-BKK\_FS0365 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 4164  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	3.3	1.1043	40	Slope : 49.1603 Intercept : -14.3467 Correlation Coefficient : 0.9996
2	3.8	1.1837	44	
3	4.7	1.3144	50	
4	5.3	1.3946	54	
5	6.2	1.5070	60	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

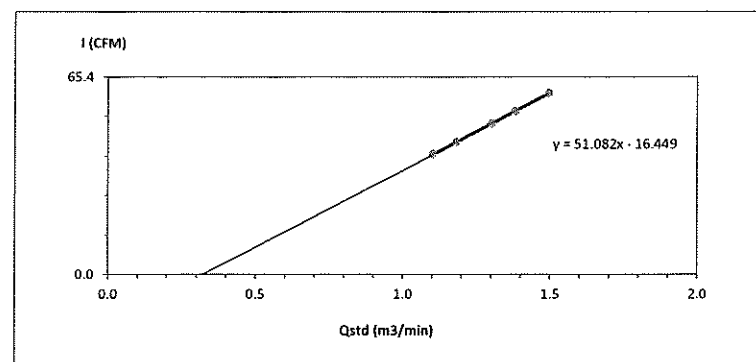
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 2 บริเวณขบวนรถไฟฟ้า Temperature (°C) : 35  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS0366  
 CalibrationSheet No.: C-060523-BKK\_FS0366 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 4156  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	3.3	1.1043	40	Slope : 51.0825 Intercept : -16.4488 Correlation Coefficient : 0.9999
2	3.8	1.1837	44	
3	4.6	1.3005	50	
4	5.2	1.3816	54	
5	6.1	1.4949	60	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

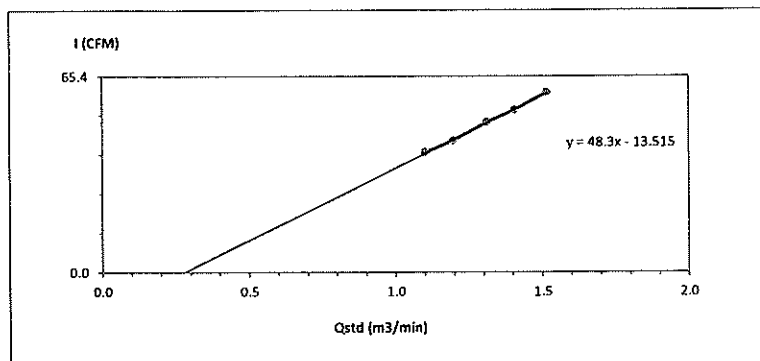
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 3 บริเวณวัดเสมียนนารี Temperature (°C) : 36  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS0368  
 Calibration Sheet No.: C-060523-BKK\_FS0368 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 4165  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	3.3	1.1025	40	Slope : 48.3003 Intercept : -13.5147 Correlation Coefficient : 0.9992
2	3.9	1.1970	44	
3	4.7	1.3123	50	
4	5.4	1.4053	54	
5	6.3	1.5165	60	



Calibrated by Mr. Teeravut Sukdee

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by Mr. Noppong Juntarupan

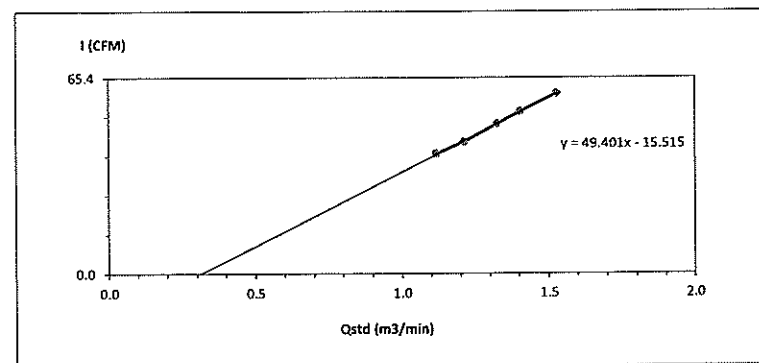
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 4 บริเวณโรงรถระบบขนส่งมวลชน Temperature (°C) : 36  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS0364  
 Calibration Sheet No.: C-060523-BKK\_FS0364 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 4154  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	3.4	1.1188	40	Slope : 49.4012 Intercept : -15.5152 Correlation Coefficient : 0.9996
2	4.0	1.2120	44	
3	4.8	1.3260	50	
4	5.4	1.4053	54	
5	6.4	1.5283	60	



Calibrated by Mr. Teeravut Sukdee

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by Mr. Noppong Juntarupan

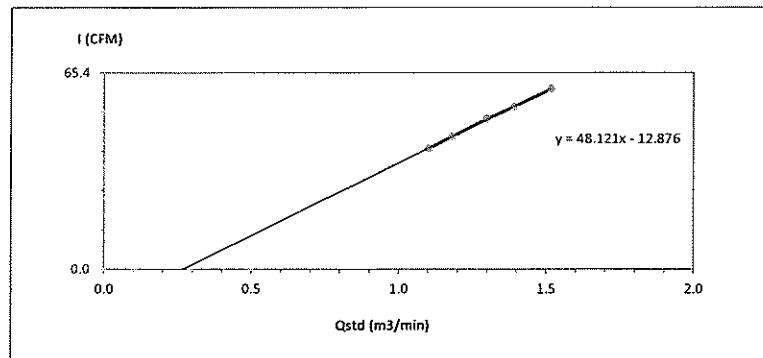
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 5 บริเวณโรงเรียนบางเขน Temperature (°C) : 36  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS0360  
 CalibrationSheet No.: C-060523-BKK\_FS0360 High Volume Model : G1051  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 1331  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.3	1.1025	40	Slope : 48.1205 Intercept : -12.8759 Correlation Coefficient : 0.9996
2	3.8	1.1818	44	
3	4.6	1.2984	50	
4	5.3	1.3924	54	
5	6.3	1.5165	60	



Calibrated by Mr. Teeravut Sukdee  
 (Mr. Teeravut Sukdee)  
 Field Scientist(2)

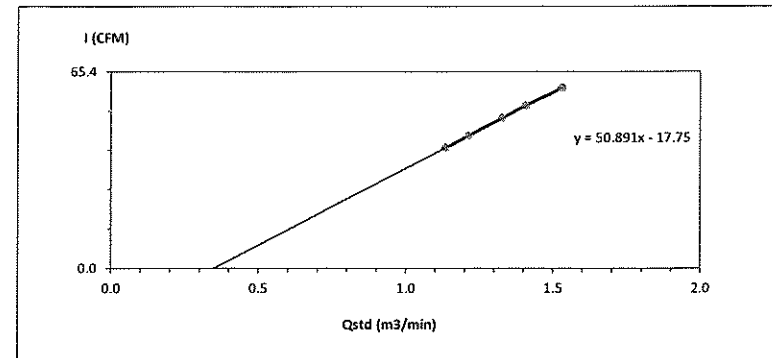
Approved by Mr. Noppong Juntarupan  
 (Mr. Noppong Juntarupan)  
 Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 6 บริเวณตลาดหลักสี่ Temperature (°C) : 35  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS0364  
 CalibrationSheet No.: C-110523-BKK\_FS0364 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 4154  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.5	1.1367	40	Slope : 50.8910 Intercept : -17.7501 Correlation Coefficient : 0.9999
2	4.0	1.2139	44	
3	4.8	1.3281	50	
4	5.4	1.4076	54	
5	6.4	1.5308	60	



Calibrated by Mr. Teeravut Sukdee  
 (Mr. Teeravut Sukdee)  
 Field Scientist(2)

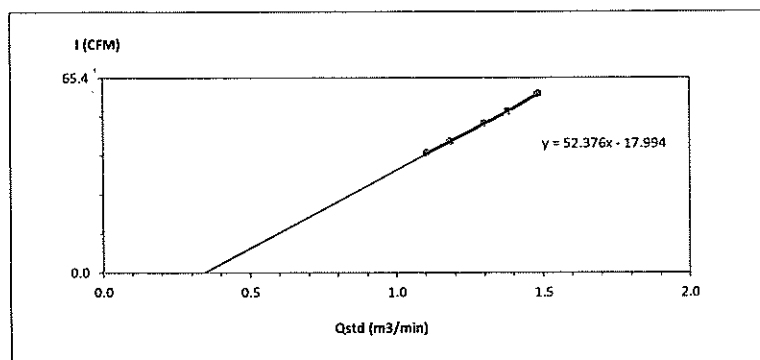
Approved by Mr. Noppong Juntarupan  
 (Mr. Noppong Juntarupan)  
 Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 7 บริเวณขบวนรถเคหะหลวง Temperature (°C) : 35  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS0366  
 Calibration Sheet No. : C-110523-BKK\_FS0366 High Volume Model : TE-5009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 4156  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression	
1	3.3	1.1043	40	Slope :	52.3761
2	3.8	1.1837	44	Intercept :	-17.9941
3	4.6	1.3005	50	Correlation Coefficient : 0.9994	
4	5.2	1.3816	54		
5	6.0	1.4828	60		



Calibrated by Mr. Teeravut Sukdee  
 Field Scientist(2)

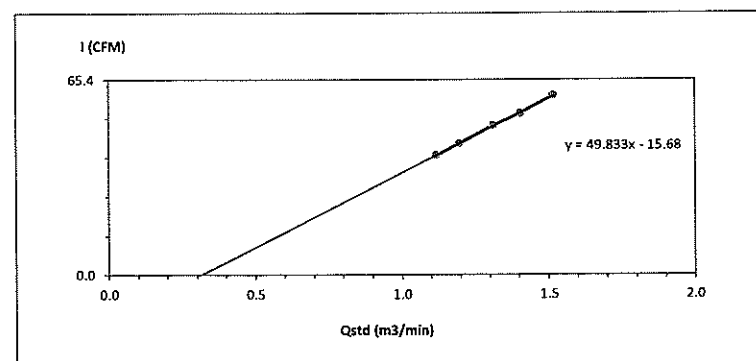
Approved by Mr. Noppong Juntarupan  
 Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 8 บริเวณวัดดอนเมือง Temperature (°C) : 36  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS0368  
 Calibration Sheet No. : C-110523-BKK\_FS0368 High Volume Model : TE-5009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 4165  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression	
1	3.4	1.1188	40	Slope :	49.8333
2	3.9	1.1970	44	Intercept :	-15.6804
3	4.7	1.3123	50	Correlation Coefficient : 0.9996	
4	5.4	1.4053	54		
5	6.3	1.5165	60		



Calibrated by Mr. Teeravut Sukdee  
 Field Scientist(2)

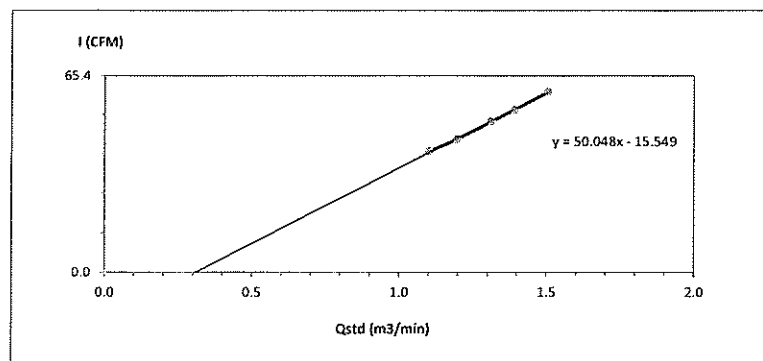
Approved by Mr. Noppong Juntarupan  
 Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 9 บริเวณหมู่บ้านปริชา Temperature (°C) : 36  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS0365  
 CalibrationSheet No.: C-110523-BKK\_FS0365 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 4164  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.3	1.1025	40	Slope : 50.0478 Intercept : -15.5495 Correlation Coefficient : 0.9993
2	3.9	1.1970	44	
3	4.7	1.3123	50	
4	5.3	1.3924	54	
5	6.2	1.5046	60	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

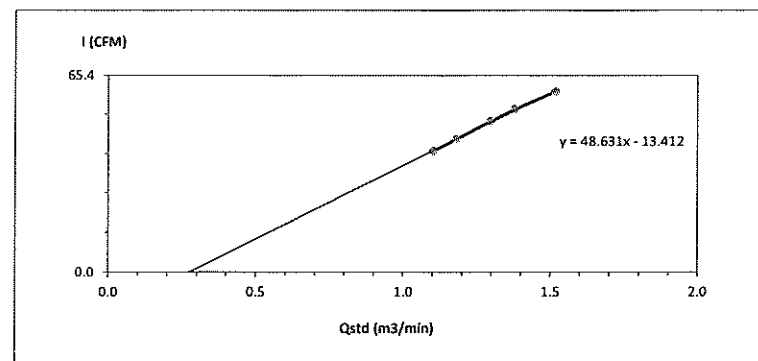
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 10 บริเวณโรงเรียนวัดนโกลสินทร์ Temperature (°C) : 36  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS0360  
 CalibrationSheet No.: C-110523-BKK\_FS0360 High Volume Model : G1051  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 1331  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.3	1.1025	40	Slope : 48.6308 Intercept : -13.4117 Correlation Coefficient : 0.9993
2	3.8	1.1818	44	
3	4.6	1.2984	50	
4	5.2	1.3794	54	
5	6.3	1.5165	60	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

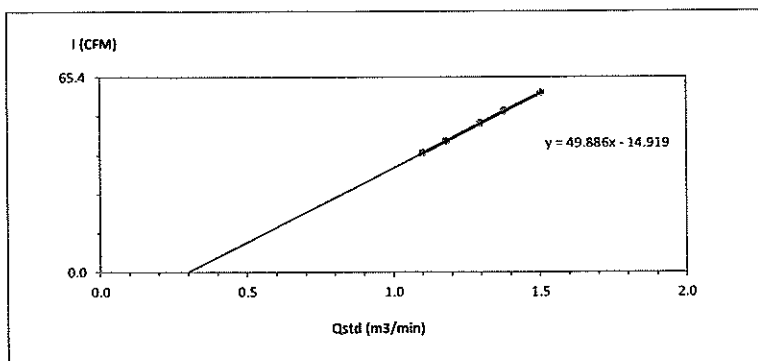




### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 11 บริเวณหมู่บ้านโสมเพลส Temperature (°C) : 36  
 Calibrate Date : 18-May-23 High Volume ID : BKK\_FS0366  
 Calibration Sheet No. : C-180523-BKK\_FS0366 High Volume Model : TE-5009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 4156  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.3	1.1025	40	Slope : 49.8862 Intercept : -14.9192 Correlation Coefficient : 0.9999
2	3.8	1.1818	44	
3	4.6	1.2984	50	
4	5.2	1.3794	54	
5	6.2	1.5046	60	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

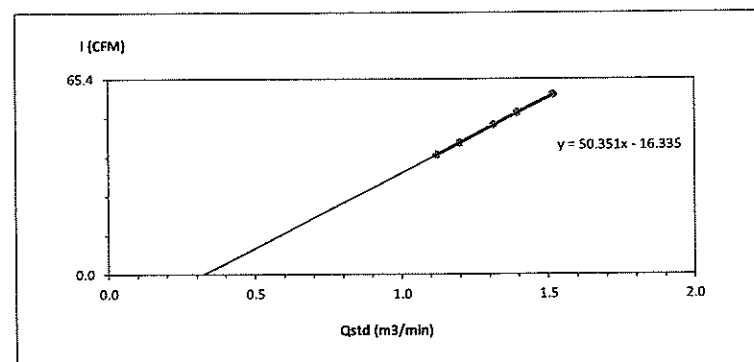
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 13 บริเวณซอยสีบุญ Temperature (°C) : 35  
 Calibrate Date : 18-May-23 High Volume ID : BKK\_FS0368  
 Calibration Sheet No. : C-180523-BKK\_FS0368 High Volume Model : TE-5009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 4165  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.4	1.1206	40	Slope : 50.3514 Intercept : -16.3345 Correlation Coefficient : 0.9999
2	3.9	1.1989	44	
3	4.7	1.3144	50	
4	5.3	1.3946	54	
5	6.3	1.5189	60	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

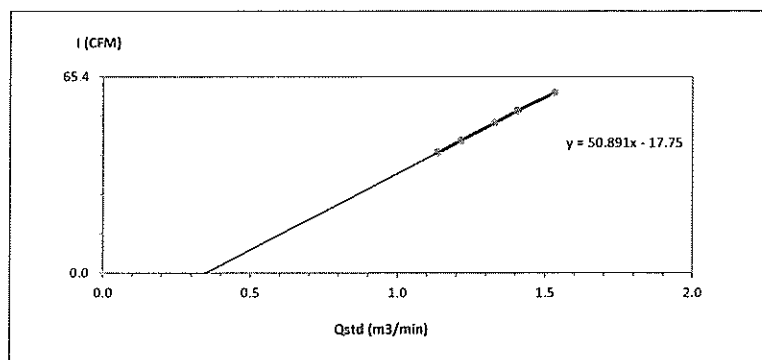
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site: S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 14 บริเวณถนนฉิมพลี Temperature (°C) : 35  
 Calibrate Date : 18-May-23 High Volume ID : BKK\_FS1059  
 Calibration Sheet No.: C-180523-BKK\_FS1059 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 5693  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.5	1.1367	40	Slope : 50.8910 Intercept : -17.7501 Correlation Coefficient : 0.9999
2	4.0	1.2139	44	
3	4.8	1.3281	50	
4	5.4	1.4076	54	
5	6.4	1.5308	60	



Calibrated by

*Mr. Teeravut Sukdee*

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

*Mr. Noppong Juntarupan*

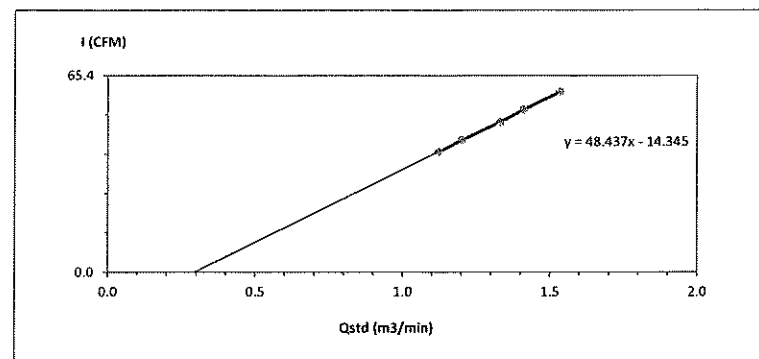
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site: S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 756  
 Calibrate Location : สถานีที่ 12 บริเวณอาคารหัดอาลัยเมโท รสกาย ประชาชน Temperature (°C) : 34  
 Calibrate Date : 7-Jul-23 High Volume ID : BKK\_FS0359  
 Calibration Sheet No.: C-070723-BKK\_FS0359 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 5194  
 Calibrator Model : TE-5028A Calibrator Slope : 1.63932  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01785

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.4	1.1231	40	Slope : 48.4371 Intercept : -14.3450 Correlation Coefficient : 0.9999
2	3.9	1.2016	44	
3	4.8	1.3311	50	
4	5.4	1.4108	54	
5	6.4	1.5343	60	



Calibrated by

*Mr. Teeravut Sukdee*

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

*Mr. Noppong Juntarupan*

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

Sartorius (Thailand) Co., Ltd.  
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310  
Tel: +66 2643 8351-6, e-mail: service.thailand@sartorius.com



NSC-TIS-17025  
CALIBRATION 0426

SARTORIUS

# Certificate of Calibration

REVIEW BY Siruk P.  
APPROVED BY KL AL  
NEXT CAL. DATE 8/2/24

Model Number : XP105DU Certificate No. : 23BCI0071  
Description : Semi-micro Balance Issued Date : Monday, February 13, 2023  
Serial Number : 1123091884 Reference No. : 203245  
ID No. : BKK\_EN0004  
Manufacturer : Mettler Toledo Page No. : 1 of 3

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

Calibrated Place : Balance Room.

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

Metrological data : Ambients Conditions:  
Capacity : 31/120 g Readability : 0.0001 g Temperature : 21.0 °C ± 3.0 °C  
Humidity : 65.0 % RH ± 5.0 % 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 - 1kg E2 s/n 37929119	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp Lutron MHB-382SD	DKSH	C19220444	5-Sep-2023

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.

*Chonchai*

Mr.Chonchai Inthana(Technical Manager)



Sartorius (Thailand) Co., Ltd.  
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310  
Tel: +66 2643 8351-6 Fax: +66 2643-8367,

SARTORIUS

# Certificate of Calibration

Model Number : XP105DU Certificate No. : 23BCI0071  
Description : Semi-micro Balance Issued Date : Monday, February 13, 2023  
Serial Number : 1123091884 Reference No. : 203245  
ID No. : BKK\_EN0004  
Manufacturer : Mettler Toledo Page No. : 2 of 3

## Calibration Results : Without Adjustment

<b>Repeatability</b> <i>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.</i>			<b>Eccentricity (Off-center loading error)</b> <i>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).</i>		
Nominal Value : (Low Load)	2.00002	20.00002	Nominal value :	20	9
2 g	2.00001	20.00001	Tolerance	N/A	9
Tolerance	2.00002	20.00001			
N/A g	2.00002	20.00001			
Nominal Value : (High Load)	2.00002	20.00000			
20 g	2.00002	20.00001			
Tolerance	2.00002	20.00000			
N/A g	2.00001	20.00000			
	2.00001	20.00001			
Standard Deviation	0.000005	0.000007			

## Linearity

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


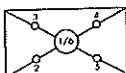
Tolerance	N/A	g		
Nominal Value	Conventional Mass Value	Displayed Value	Deviation	Uncertainty
(g)	(g)	(g)	(g)	(g)
0.1	0.10000	0.10000	0.00000	0.000022
0.5	0.50001	0.50000	-0.00001	0.000023
1	1.00000	1.00000	0.00000	0.000024
2	2.00002	2.00001	-0.00001	0.000026
5	5.00002	5.00002	0.00000	0.000030
10	10.00002	10.00002	0.00000	0.000035
15	15.00004	15.00004	0.00000	0.000053
20	20.00000	20.00000	0.00000	0.000053
25	25.00002	25.00002	0.00000	0.000089
30	30.00002	30.00004	0.00002	0.000089

# Certificate of Calibration

Model Number : XS105DU  
Description : Semi-micro Balance  
Serial Number : 1123091884  
ID No. : BKK\_EN0004  
Manufacturer : Mettler Toledo

Certificate No. : 23BCI0071  
Issued Date : Monday, February 13, 2023  
Reference No. : 203245  
Page No. : 3 of 3

## Calibration Results : Without Adjustment

Repeatability			Eccentricity (Off-center loading error)																
<p>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.</p>			<p>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).</p>																
Nominal Value : (Low Load)		100.0000	Nominal value :		g														
		100.0000	Tolerance	N/A	g														
Tolerance		100.0000																	
N/A	g	100.0000																	
Nominal Value : (High Load)		100.0000																	
100	g	100.0000																	
Tolerance		99.9999	<table><tr><th></th><th>Difference</th></tr><tr><td>1</td><td>-</td></tr><tr><td>2</td><td>-</td></tr><tr><td>3</td><td>-</td></tr><tr><td>4</td><td>-</td></tr><tr><td>5</td><td>-</td></tr><tr><td>6</td><td>-</td></tr></table>				Difference	1	-	2	-	3	-	4	-	5	-	6	-
	Difference																		
1	-																		
2	-																		
3	-																		
4	-																		
5	-																		
6	-																		
N/A	g	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	N/A	g
Nominal Value	Conventional Mass Value	Displayed Value
(g)	(g)	(g)
50	50.0000	50.0000
55	55.0000	55.0000
60	60.0000	60.0000
65	65.0001	65.0001
70	70.0000	70.0000
80	80.0000	80.0000
90	90.0001	90.0001
100	100.0000	100.0000
110	110.0000	110.0000
120	120.0000	120.0000
Deviation	Uncertainty	
(g)	(g)	
0.0000	0.00012	
0.0000	0.00015	
0.0000	0.00015	
0.0000	0.00015	
0.0000	0.00015	
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0.0000	0.00018	
0.0000	0.00018	
0.0000	0.00026	
0.0000	0.00026	

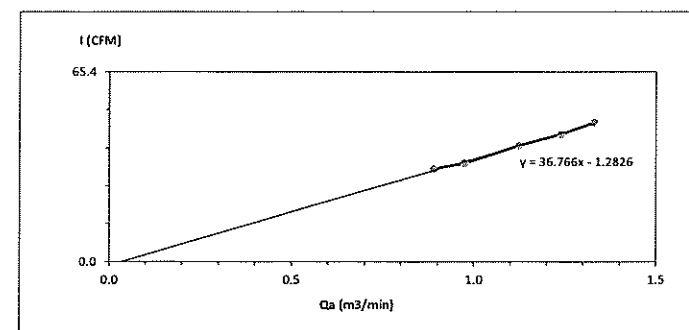
End of Report.



## High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited  
Calibrate Location : สถานีรถไฟฟ้า 1 สถานี บางเขน กรุงเทพมหานคร  
Calibrate Date : 6-May-23  
Calibration Sheet No. : C-060523-BKK\_FS0374  
Calibrator ID : BKK\_FS0624  
Calibrator Model : TE-5028A  
Calibrator S/N : 2584  
Barometric Pressure (mm Hg) : 755  
Temperature (°C) : 35  
High Volume ID : BKK\_FS0374  
High Volume Model : TE-S009X  
High Volume S/N : 5195  
Calibrator Slope : 1.0268  
Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.891	32	Slope : 36.7659 Intercept : -1.2826 Correlation Coefficient : 0.9977
2	2.4	0.975	34	
3	3.2	1.124	40	
4	3.9	1.240	44	
5	4.5	1.331	48	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

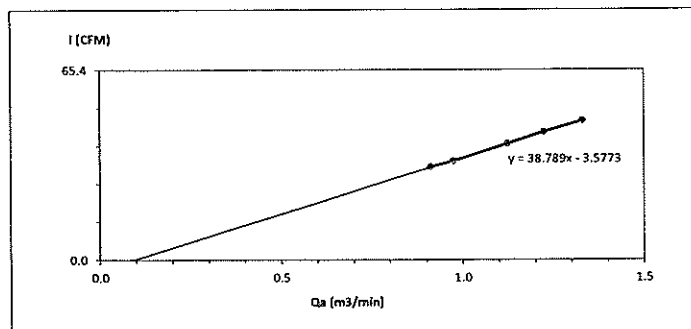
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 2 บริเวณนิคมรถไฟ กม.11 Temperature (°C) : 35  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS0375  
 CalibrationSheet No.: C-060523-BKK\_FS0375 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 5196  
 Calibrator Model : TE-5028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.1	0.913	32	Slope : 38.7886 Intercept : -3.5773 Correlation Coefficient : 0.9997
2	2.4	0.975	34	
3	3.2	1.124	40	
4	3.8	1.224	44	
5	4.5	1.331	48	



Calibrated by

( Mr.Teeravut Sukdee )  
Field Scientist(2)

Approved by

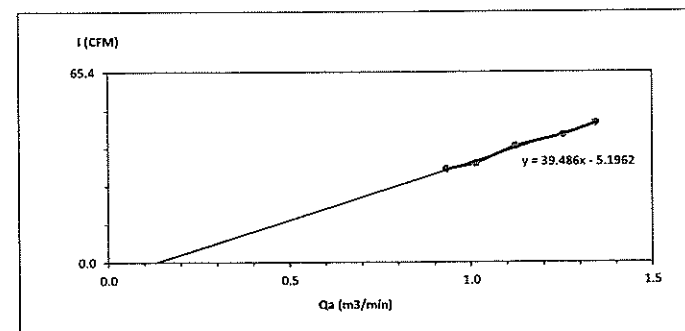
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานีที่ 3 บริเวณวัดเลียบขนนา Temperature (°C) : 35  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS1062  
 CalibrationSheet No.: C-060523-BKK\_FS1062 High Volume Model : TE-5009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 5686  
 Calibrator Model : TE-5028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.2	0.934	32	Slope : 39.4864 Intercept : -5.1962 Correlation Coefficient : 0.9954
2	2.6	1.014	34	
3	3.2	1.124	40	
4	4.0	1.255	44	
5	4.6	1.345	48	



Calibrated by

( Mr.Teeravut Sukdee )  
Field Scientist(2)

Approved by

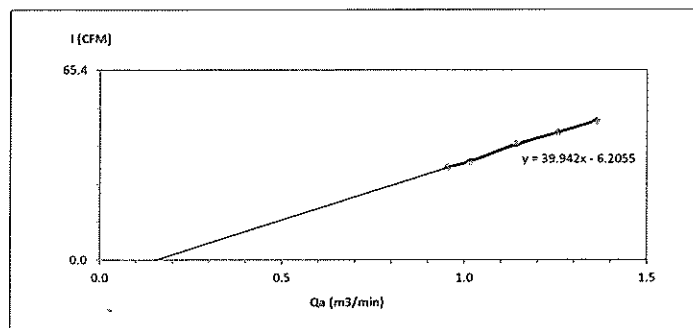
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 4 บริเวณโรงรถสนามหลวงใต้ Temperature (°C) : 36  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS0380  
 Calibration Sheet No. : C-060523-BKK\_FS0380 High Volume Model : TE-5009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 4163  
 Calibrator Model : TE-5028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.3	0.956	32	Slope : 39.9422 Intercept : -6.2055 Correlation Coefficient : 0.9987
2	2.6	1.016	34	
3	3.3	1.143	40	
4	4.0	1.257	44	
5	4.7	1.362	48	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

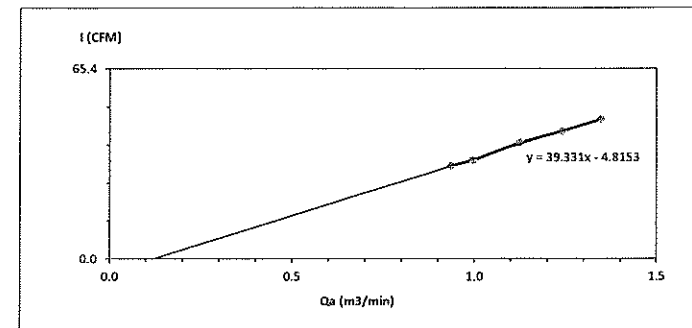
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 5 บริเวณโรงเรียนบางเขน Temperature (°C) : 36  
 Calibrate Date : 6-May-23 High Volume ID : BKK\_FS0382  
 Calibration Sheet No. : C-060523-BKK\_FS0382 High Volume Model : TE-5009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 4786  
 Calibrator Model : TE-5028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.935	32	Slope : 39.3314 Intercept : -4.8153 Correlation Coefficient : 0.9987
2	2.5	0.996	34	
3	3.2	1.126	40	
4	3.9	1.242	44	
5	4.6	1.347	48	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

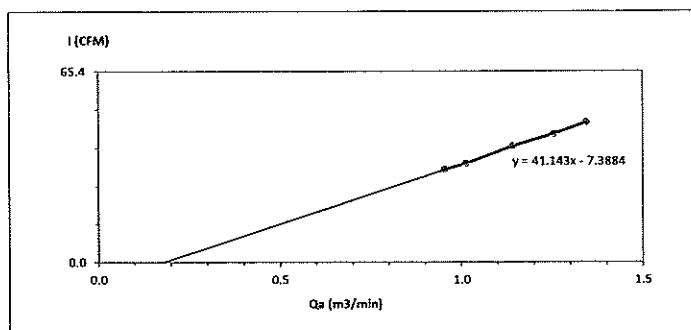
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 6 บริเวณตลาดหลักสี่ Temperature (°C) : 35  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS0380  
 Calibration Sheet No. : C-110523-BKK\_FS0380 High Volume Model : TE-5009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 4163  
 Calibrator Model : TE-5028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.3	0.955	32	Slope : 41.1432 Intercept : -7.3884 Correlation Coefficient : 0.9989
2	2.6	1.014	34	
3	3.3	1.141	40	
4	4.0	1.255	44	
5	4.6	1.345	48	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

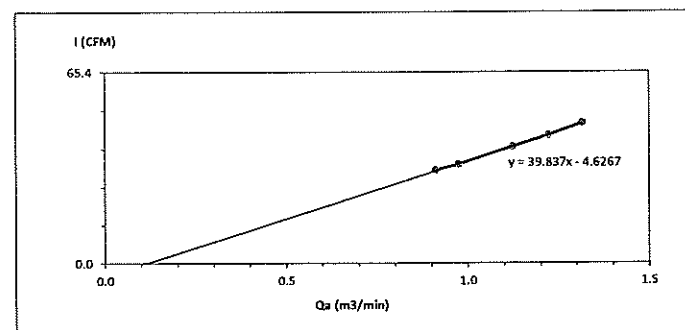
FORM NO.: F 06-074 REVISION NO.: - ISSUE DATE: 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 7 บริเวณขบวนรถโดยสารสายสีแดง Temperature (°C) : 35  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS0375  
 Calibration Sheet No. : C-110523-BKK\_FS0375 High Volume Model : TE-5009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 5196  
 Calibrator Model : TE-5028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.1	0.913	32	Slope : 39.8369 Intercept : -4.6267 Correlation Coefficient : 0.9995
2	2.4	0.975	34	
3	3.2	1.124	40	
4	3.8	1.224	44	
5	4.4	1.316	48	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

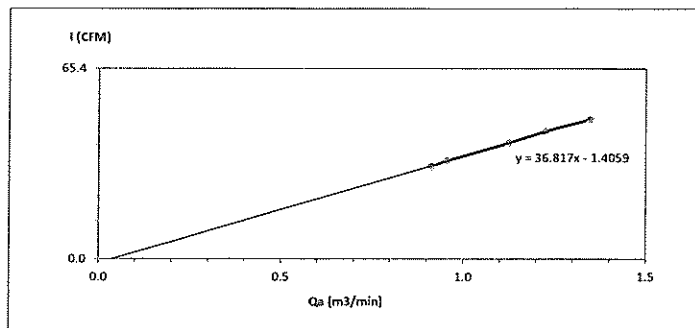
FORM NO.: F 06-074 REVISION NO.: - ISSUE DATE: 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 8 บริเวณวัดดอนเมือง Temperature (°C) : 36  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS1062  
 Calibration Sheet No.: C-110523-BKK\_FS1062 High Volume Model : TE-S009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 5686  
 Calibrator Model : TE-S028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.1	0.914	32	Slope : 36.8166 Intercept : -1.4059 Correlation Coefficient : 0.9994
2	2.3	0.956	34	
3	3.2	1.126	40	
4	3.8	1.226	44	
5	4.6	1.347	48	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

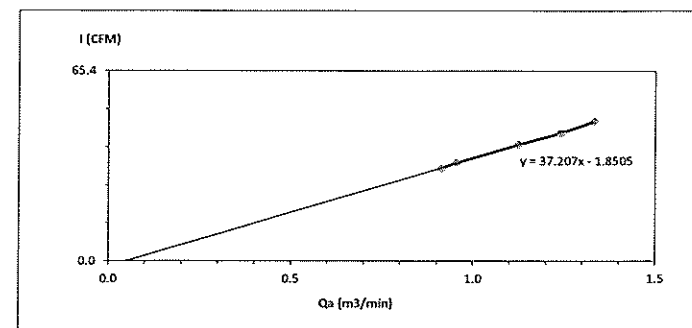
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 9 บริเวณถนนพหลโยธิน Temperature (°C) : 36  
 Calibrate Date : 11-May-23 High Volume ID : BKK\_FS0374  
 Calibration Sheet No.: C-110523-BKK\_FS0374 High Volume Model : TE-S009X  
 Calibrator ID: BKK\_FS0624 High Volume S/N : 5195  
 Calibrator Model : TE-S028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.1	0.914	32	Slope : 37.2073 Intercept : -1.8505 Correlation Coefficient : 0.9992
2	2.3	0.956	34	
3	3.2	1.126	40	
4	3.9	1.242	44	
5	4.5	1.333	48	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist(2)

Approved by

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



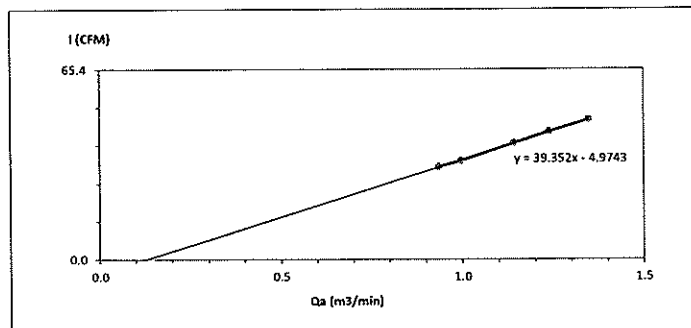


### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited  
 Calibrate Location : สถานี 10 บริเวณโรงเรือนรถคนโดยสาร  
 Calibrate Date : 11-May-23  
 Calibration Sheet No.: C-110523-BKK\_FS0382  
 Calibrator ID: BKK\_FS0624  
 Calibrator Model: TE-5028A  
 Calibrator S/N: 2584

Barometric Pressure (mm Hg) : 755  
 Temperature (°C) : 36  
 High Volume ID : BKK\_FS0382  
 High Volume Model: TE-5009X  
 High Volume S/N: 4786  
 Calibrator Slope : 1.0268  
 Calibrator Intercept: -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.2	0.935	32	Slope : 39.3518 Intercept : -4.9743 Correlation Coefficient : 0.9997
2	2.5	0.996	34	
3	3.3	1.143	40	
4	3.9	1.242	44	
5	4.6	1.347	48	



Calibrated by

( Mr. Teeravut Sukdee )  
Field Scientist(2)

Approved by

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

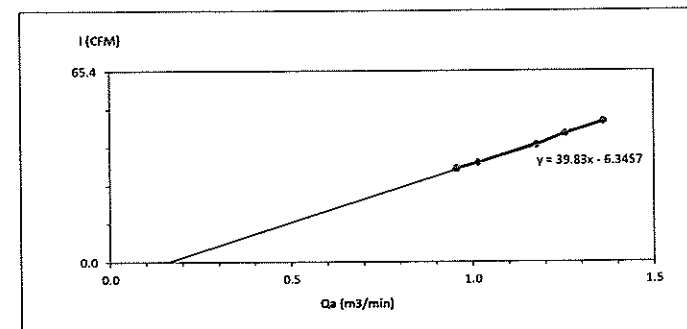


### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited  
 Calibrate Location : สถานี 11 บริเวณหมู่บ้านไทยเฟส  
 Calibrate Date : 18-May-23  
 Calibration Sheet No.: C-180523-BKK\_FS1062  
 Calibrator ID: BKK\_FS0624  
 Calibrator Model: TE-5028A  
 Calibrator S/N: 2584

Barometric Pressure (mm Hg) : 755  
 Temperature (°C) : 36  
 High Volume ID : BKK\_FS1062  
 High Volume Model: TE-5009X  
 High Volume S/N: 5686  
 Calibrator Slope : 1.0268  
 Calibrator Intercept: -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.3	0.956	32	Slope : 39.8298 Intercept : -6.3457 Correlation Coefficient : 0.9988
2	2.6	1.016	34	
3	3.5	1.177	40	
4	4.0	1.257	44	
5	4.7	1.362	48	



Calibrated by

( Mr. Teeravut Sukdee )  
Field Scientist(2)

Approved by

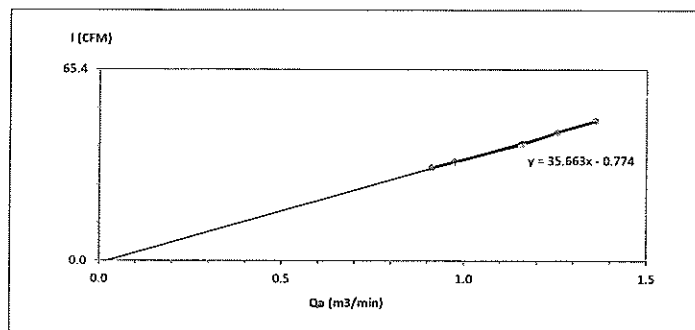
(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 13 บริเวณขบวนรถ Temperature (°C) : 35  
 Calibrate Date : 18-May-23 High Volume ID : BKK\_FS0379  
 Calibration Sheet No. : C-180523-BKK\_FS0379 High Volume Model : TE-S009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 4158  
 Calibrator Model : TE-S028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.1	0.913	32	Slope : 35.6631 Intercept : -0.7740 Correlation Coefficient : 0.9988
2	2.4	0.975	34	
3	3.4	1.158	40	
4	4.0	1.255	44	
5	4.7	1.360	48	



Calibrated by

( Mr. Teeravut Sukdee )  
Field Scientist(2)

Approved by

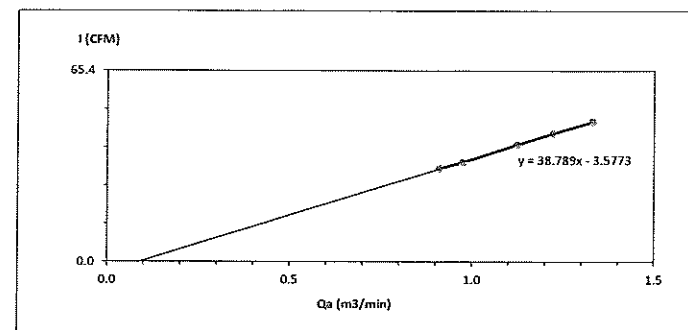
( Mr. Noppong Juntarupan )  
Enviro Field Coordinator Scientist (3)



### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited Barometric Pressure (mm Hg) : 755  
 Calibrate Location : สถานี 14 บริเวณถนนรัชดาภิเษก Temperature (°C) : 35  
 Calibrate Date : 18-May-23 High Volume ID : BKK\_FS0375  
 Calibration Sheet No. : C-180523-BKK\_FS0375 High Volume Model : TE-S009X  
 Calibrator ID : BKK\_FS0624 High Volume S/N : 5196  
 Calibrator Model : TE-S028A Calibrator Slope : 1.0268  
 Calibrator S/N : 2584 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	2.1	0.913	32	Slope : 38.7886 Intercept : -3.5773 Correlation Coefficient : 0.9997
2	2.4	0.975	34	
3	3.2	1.124	40	
4	3.8	1.224	44	
5	4.5	1.331	48	



Calibrated by

( Mr. Teeravut Sukdee )  
Field Scientist(2)

Approved by

( Mr. Noppong Juntarupan )  
Enviro Field Coordinator Scientist (3)

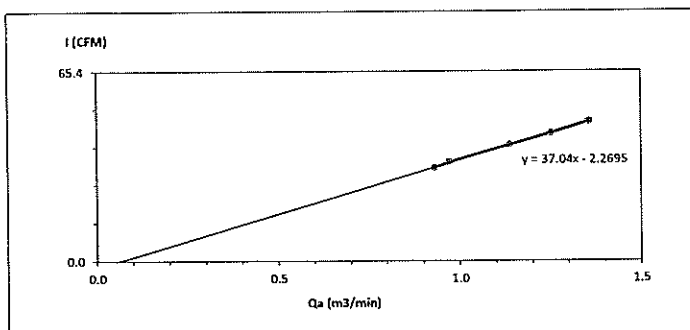


### High Volume Air Sampler Calibration Worksheet

Project Site : S.R.T. Electrified Train Company Limited  
 Calibrate Location : สถานี 12 บริษัท รถไฟฟ้า รฟท. จำกัด  
 Calibrate Date : 7-Jul-23  
 Calibration Sheet No.: C-070723-BKK\_FS0389  
 Calibrator ID: BKK\_FS0624  
 Calibrator Model: TE-5028A  
 Calibrator S/N: 2584

Barometric Pressure (mm Hg) : 756  
 Temperature (°C) : 34  
 High Volume ID: BKK\_FS0389  
 High Volume Model: TE-5009X  
 High Volume S/N: 5329  
 Calibrator Slope : 1.0268  
 Calibrator Intercept : -0.01116

Test No.	Delta H <sub>2</sub> O (inch)	Qa (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.932	32	Slope : 37.0404 Intercept : -2.2695 Correlation Coefficient : 0.9996
2	2.4	0.973	34	
3	3.3	1.139	40	
4	4.0	1.252	44	
5	4.7	1.357	48	



Calibrated by

(Mr. Teeravut Sukdee)  
Field Scientist (2)

Approved by

(Mr. Noppong Juntarupan)  
Enviro Field Coordinator Scientist (3)

FORM NO.: F 06-074 REVISION NO.: - ISSUE DATE: 14/03/16

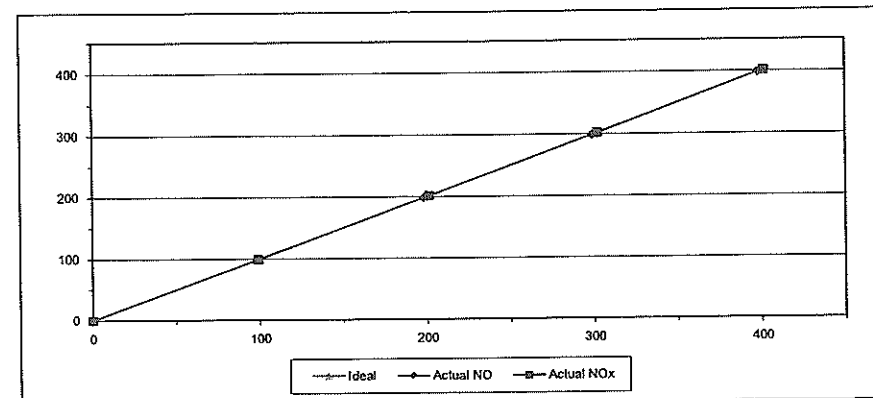


### MULTIPOINT CALIBRATION REPORT

Calibration Date : 5-Jan-23  
 Manufacturer : HORIBA  
 Serial No. : SUDL58MU  
 Calibrator Manufacturer : Teledyne API  
 Serial No. : 947  
 Std. Gas Concentration (PPM) : 55.88  
 Cylinder Pressure (psi) : 1800  
 Certified Date : 9-Feb-22

Equipment Name : NOx Analyzer  
 Model : APNA-370  
 Equipment ID : BKK\_FS1090  
 Model : 700  
 Cylinder No. : GN0027222  
 Certified By : Airgas Inc.  
 Expired Date : 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.70	-1.30	-1.30	99.10	-0.90	-0.90
2	200.00	198.30	-1.70	-0.85	201.50	1.50	0.75
3	300.00	299.30	-0.70	-0.23	302.20	2.20	0.73
4	400.00	398.00	-2.00	-0.50	401.70	1.70	0.42
AVERAGE (%)				-0.56			0.22



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

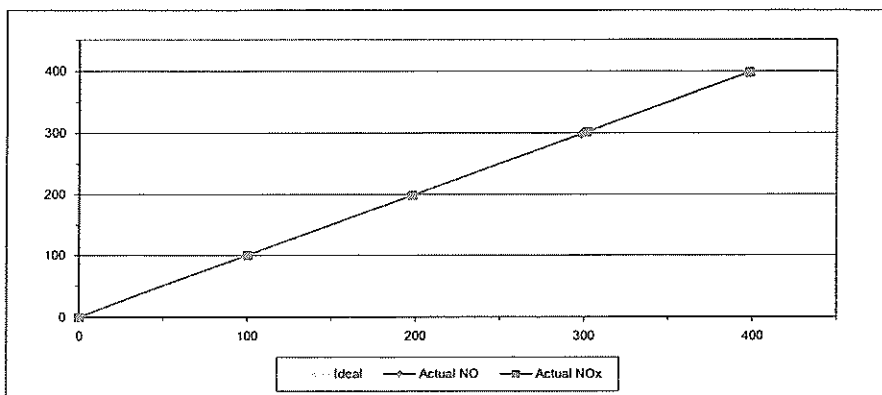
ALS Laboratory Group  
 FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	PX13CWA0	Equipment ID	BKK_FS1088
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	99.00	-1.00	-1.00	100.30	0.30	0.30
2	200.00	198.30	-1.70	-0.85	198.10	-1.90	-0.95
3	300.00	298.40	-1.60	-0.53	301.70	1.70	0.57
4	400.00	396.70	-3.30	-0.83	398.30	-1.70	-0.42
AVERAGE (%)				-0.62			-0.08



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group

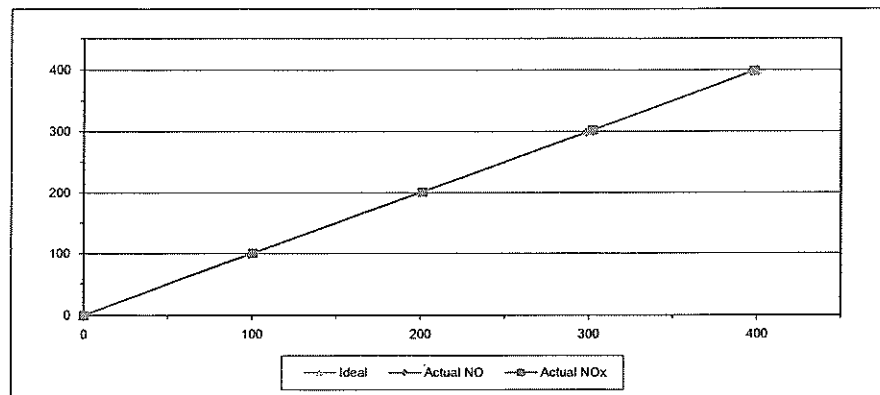
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	X9RAXH0D	Equipment ID	BKK_FS0803
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20	100.50	0.50	0.50
2	200.00	201.50	1.50	0.75	201.20	1.20	0.60
3	300.00	298.40	-1.60	-0.53	302.30	2.30	0.77
4	400.00	396.90	-3.10	-0.78	398.50	-1.50	-0.38
AVERAGE (%)				-0.33			0.32



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group

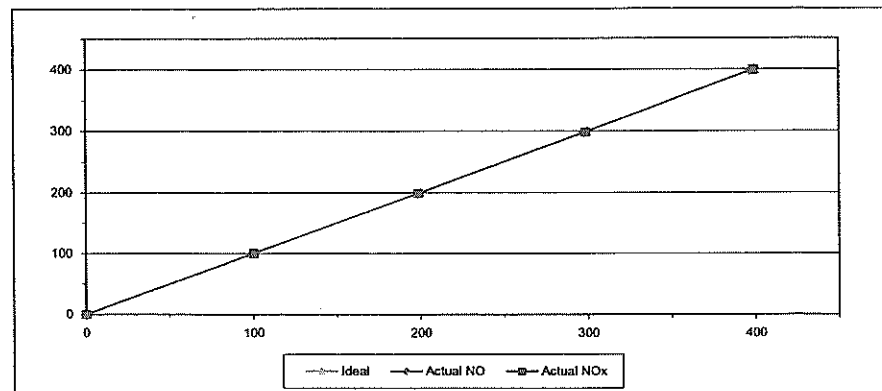
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	R0A0GWJC	Equipment ID	BKK_FS0794
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	99.40	-0.60	-0.60	100.20	0.20	0.20
2	200.00	198.20	-1.80	-0.90	198.60	-1.40	-0.70
3	300.00	297.50	-2.50	-0.83	298.70	-1.30	-0.43
4	400.00	396.70	-3.30	-0.83	399.10	-0.90	-0.22
AVERAGE (%)				-0.61			-0.21



Calibrated By

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

Approved By

( Mr.Sarayuth Jitranont )  
Assistant General Manager

ALS Laboratory Group

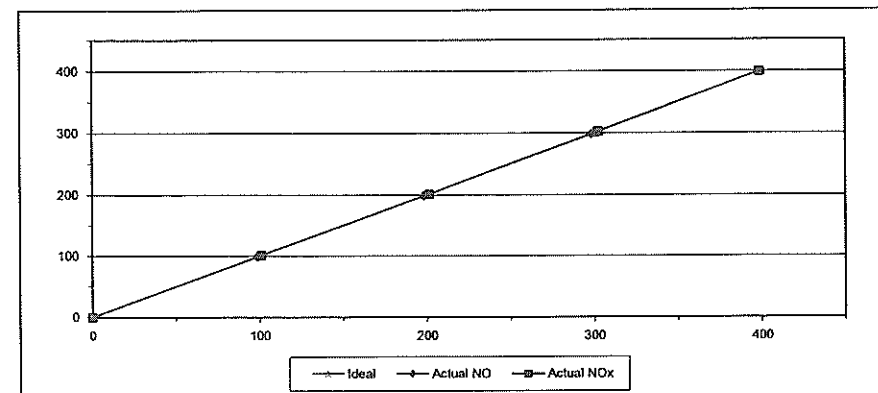
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	R26E09EW	Equipment ID	BKK_FS0789
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	99.00	-1.00	-1.00	101.10	1.10	1.10
2	200.00	198.20	-1.80	-0.90	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	302.50	2.50	0.83
4	400.00	398.50	-1.50	-0.38	398.90	-1.10	-0.28
AVERAGE (%)				-0.54			0.48



Calibrated By

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

Approved By

( Mr.Sarayuth Jitranont )  
Assistant General Manager

ALS Laboratory Group

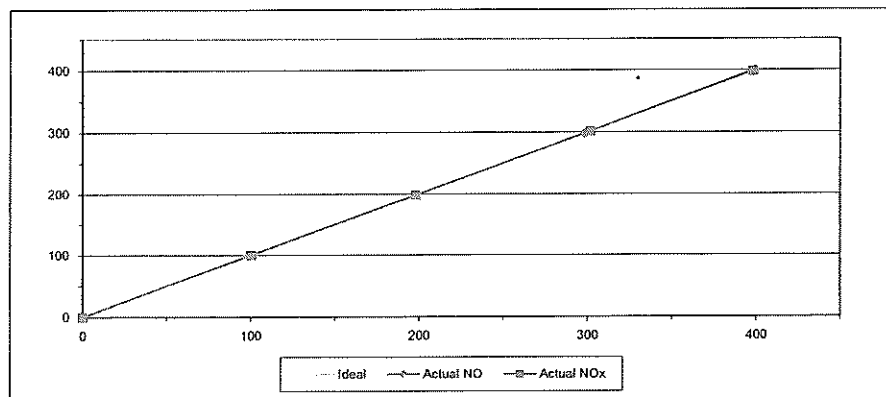
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	PX13CWA0	Equipment ID	BKK_FS1088
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	99.00	-1.00	-1.00	100.30	0.30	0.30
2	200.00	198.30	-1.70	-0.85	198.10	-1.90	-0.95
3	300.00	298.40	-1.60	-0.53	301.70	1.70	0.57
4	400.00	396.70	-3.30	-0.83	398.30	-1.70	-0.42
AVERAGE (%)				-0.62			-0.08



Calibrated By

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

Approved By

( Mr.Sarayuth Jitranont )  
Assistant General Manager

ALS Laboratory Group

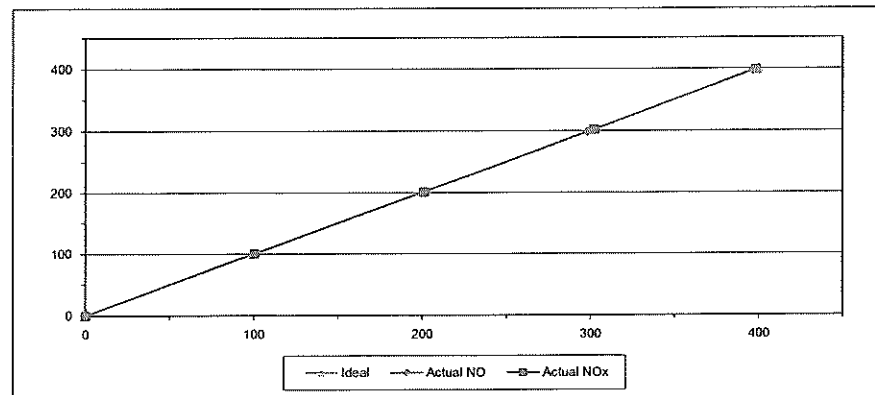
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	X9RAXH0D	Equipment ID	BKK_FS0803
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20	100.50	0.50	0.50
2	200.00	201.50	1.50	0.75	201.20	1.20	0.60
3	300.00	298.40	-1.60	-0.53	302.30	2.30	0.77
4	400.00	396.90	-3.10	-0.78	398.50	-1.50	-0.38
AVERAGE (%)				-0.33			0.32



Calibrated By

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

Approved By

( Mr.Sarayuth Jitranont )  
Assistant General Manager

ALS Laboratory Group

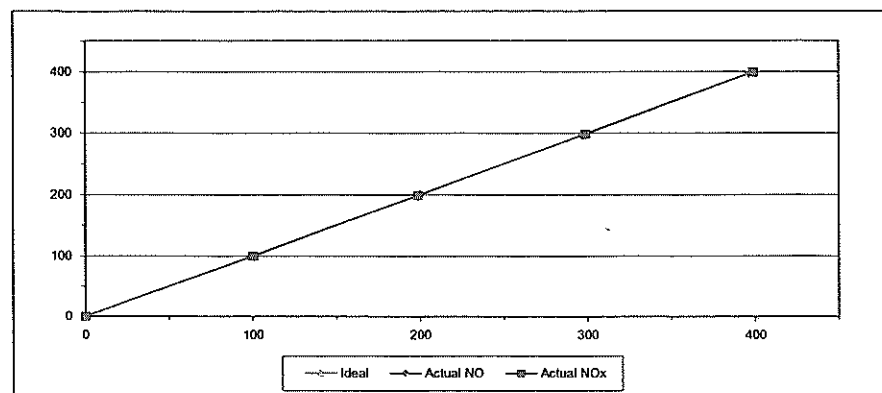
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	R0A0GWJC	Equipment ID	BKK_FS0794
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	99.40	-0.60	-0.60	100.20	0.20	0.20
2	200.00	198.20	-1.80	-0.90	198.60	-1.40	-0.70
3	300.00	297.50	-2.50	-0.83	298.70	-1.30	-0.43
4	400.00	396.70	-3.30	-0.83	399.10	-0.90	-0.22
AVERAGE (%)				-0.61			-0.21



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group

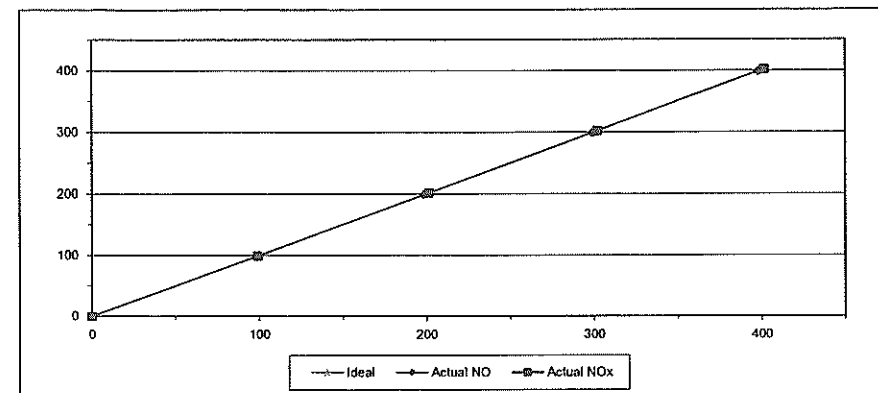
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	SUDL58MU	Equipment ID	BKK_FS1090
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	99.10	-0.90	-0.90
2	200.00	198.30	-1.70	-0.85	201.50	1.50	0.75
3	300.00	299.30	-0.70	-0.23	302.20	2.20	0.73
4	400.00	398.00	-2.00	-0.50	401.70	1.70	0.42
AVERAGE (%)				-0.56			0.22



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

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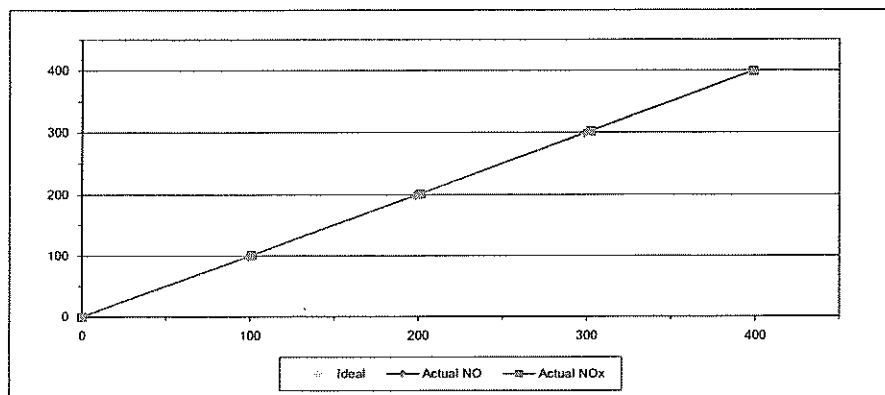
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	R26E09EW	Equipment ID	BKK_FS0789
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	99.00	-1.00	-1.00	101.10	1.10	1.10
2	200.00	198.20	-1.80	-0.90	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	302.50	2.50	0.83
4	400.00	398.50	-1.50	-0.38	398.90	-1.10	-0.28
AVERAGE (%)				-0.54			0.48



Calibrated By

( Mr.Jirawut Sakarn )  
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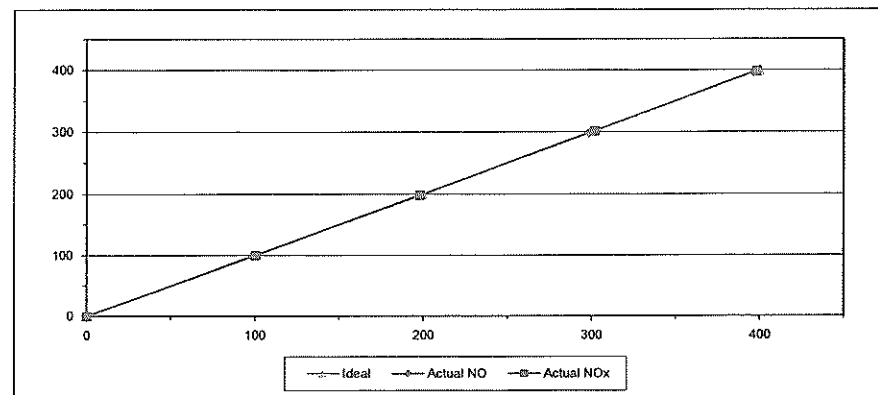
FORM NO.: F 06-056 REVISION NO.: ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	PX13CWA0	Equipment ID	BKK_FS1088
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	99.00	-1.00	-1.00	100.30	0.30	0.30
2	200.00	198.30	-1.70	-0.85	198.10	-1.90	-0.95
3	300.00	298.40	-1.60	-0.53	301.70	1.70	0.57
4	400.00	396.70	-3.30	-0.83	398.30	-1.70	-0.42
AVERAGE (%)				-0.62			-0.08



Calibrated By

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

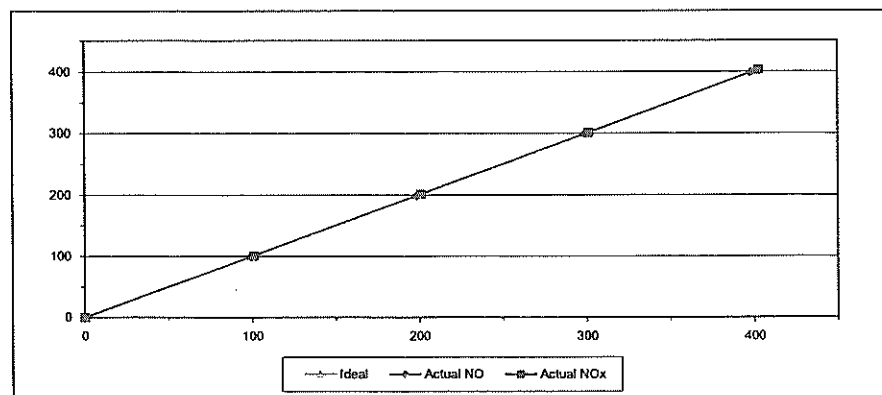




### MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	XLTRBSJ	Equipment ID	BKK_FS1092
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30	101.00	1.00	1.00
2	200.00	198.10	-1.90	-0.95	201.00	1.00	0.50
3	300.00	299.10	-0.90	-0.30	301.40	1.40	0.47
4	400.00	398.20	-1.80	-0.45	402.80	2.80	0.70
AVERAGE (%)				-0.38			0.55



Calibrated By

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Approved By

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Assistant General Manager

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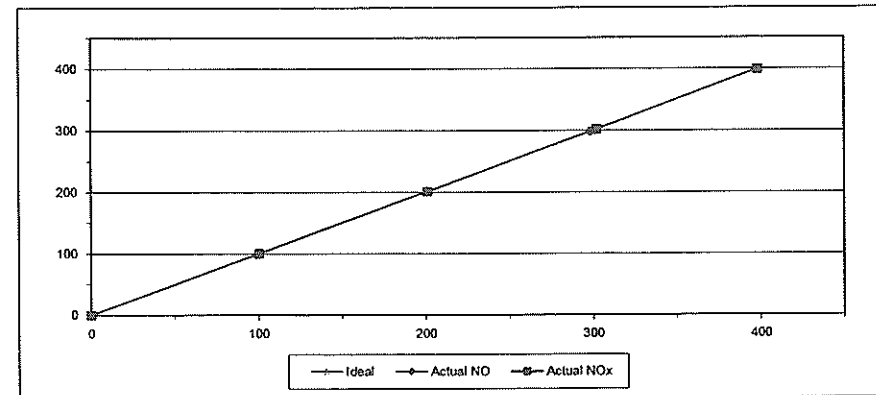
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	X9RAXH0D	Equipment ID	BKK_FS0803
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20	100.50	0.50	0.50
2	200.00	201.50	1.50	0.75	201.20	1.20	0.60
3	300.00	298.40	-1.60	-0.53	302.30	2.30	0.77
4	400.00	396.90	-3.10	-0.78	398.50	-1.50	-0.38
AVERAGE (%)				-0.33			0.32



Calibrated By

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Assistant General Manager

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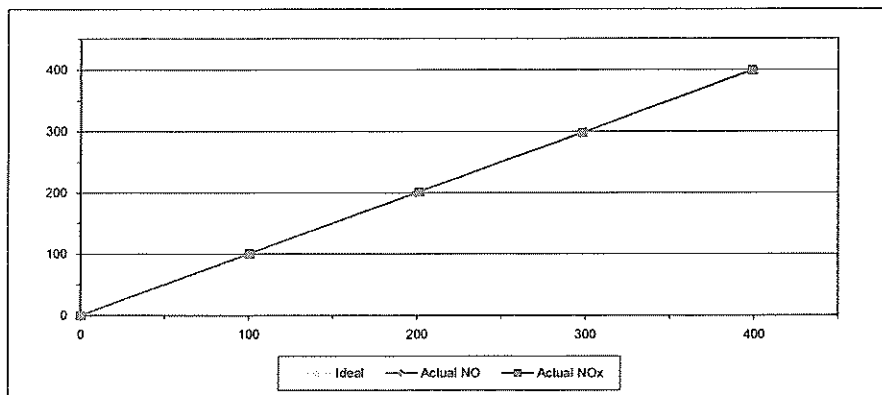
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-23	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	WPY0JMWd	Equipment ID	BKK_FS0782
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	100.60	0.60	0.60
2	200.00	199.70	-0.30	-0.15	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	298.30	-1.70	-0.57
4	400.00	398.70	-1.30	-0.33	399.00	-1.00	-0.25
AVERAGE (%)				-0.26			0.11



Calibrated By

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Approved By

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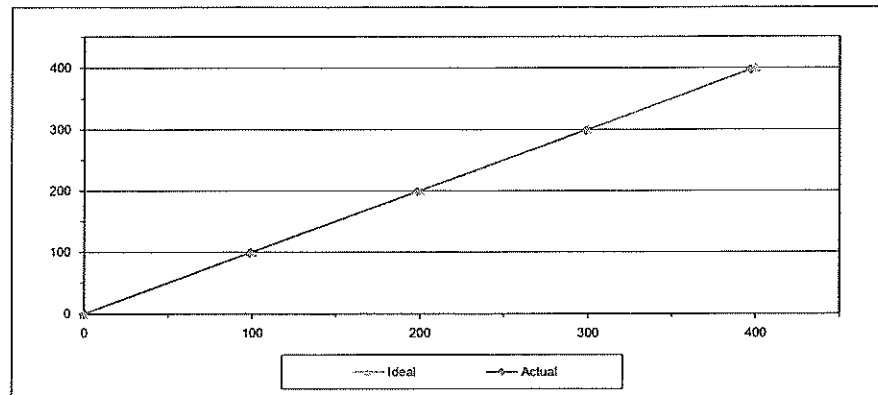
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	SLWK5D7G	Equipment ID	BKK_FS0790
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	298.50	-1.50	-0.50
4	400.00	397.00	-3.00	-0.75
AVERAGE (%)				-0.64



Calibrated By

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

Approved By

(Mr.Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group

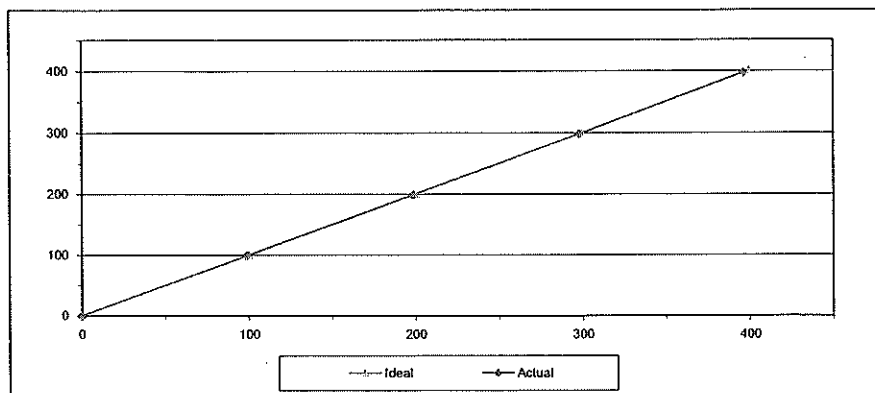
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	VX4SDB2M	Equipment ID	RYG_FS0451
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	297.90	-2.10	-0.70
4	400.00	396.20	-3.80	-0.95
AVERAGE (%)				-0.73



Calibrated By

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

Approved By

( Mr.Sarayuth Jitranont )  
Assistant General Manager

ALS Laboratory Group

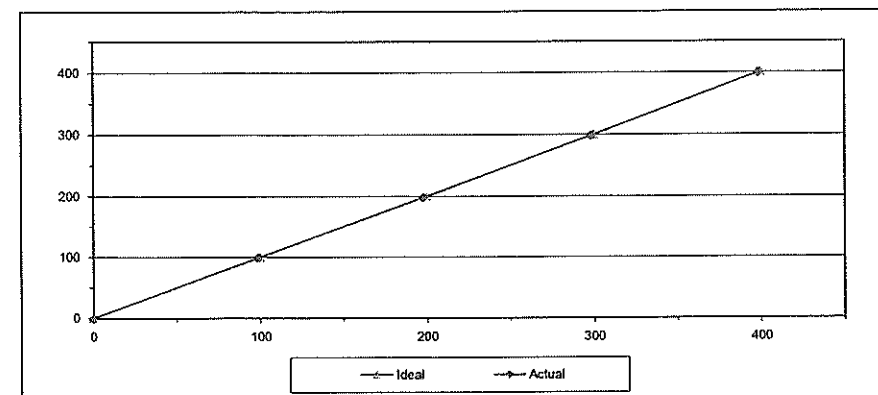
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	YD1WSD2G	Equipment ID	BKK_FS0786
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.80	-1.20	-1.20
2	200.00	197.80	-2.20	-1.10
3	300.00	298.20	-1.80	-0.60
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.64



Calibrated By

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

Approved By

( Mr.Sarayuth Jitranont )  
Assistant General Manager

ALS Laboratory Group

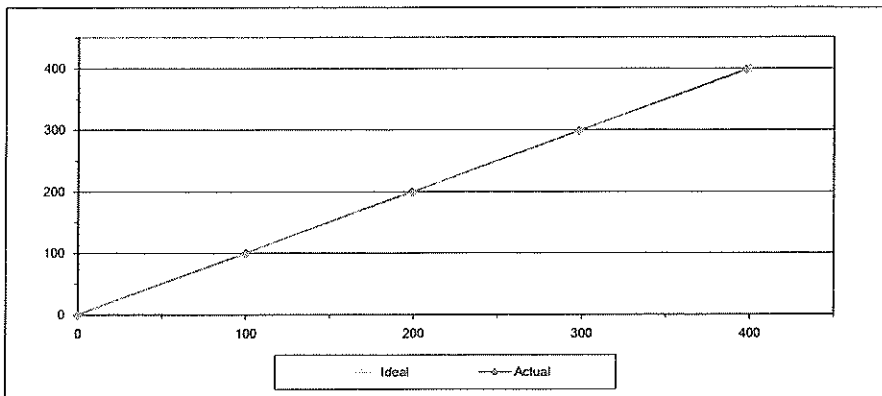
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### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	Teledyne API	Model	T300
Serial No.	056	Equipment ID	BKK_FS0742
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	100.20	0.20	0.20
2	200.00	199.20	-0.80	-0.40
3	300.00	298.20	-1.80	-0.60
4	400.00	397.60	-2.40	-0.60
AVERAGE (%)				-0.26



Calibrated By

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

Approved By

( Mr.Sarayuth Jittrantont )  
Assistant General Manager

ALS Laboratory Group

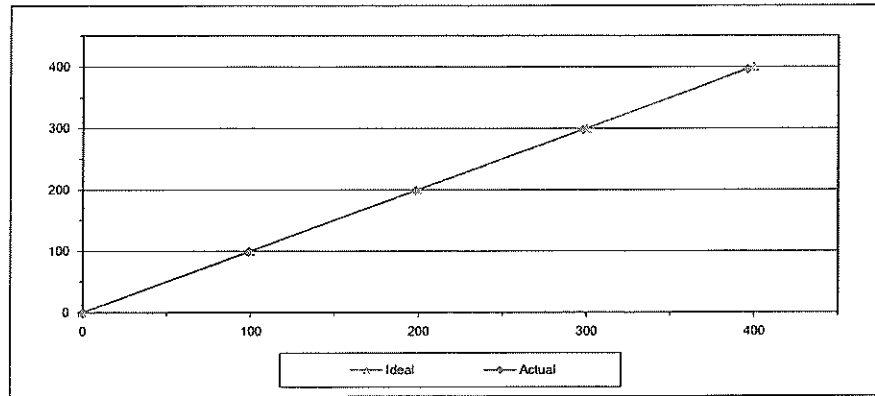
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	8M404056	Equipment ID	BKK_FS1065
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	297.80	-2.20	-0.73
4	400.00	395.80	-4.20	-1.05
AVERAGE (%)				-0.75



Calibrated By

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

Approved By

( Mr.Sarayuth Jittrantont )  
Assistant General Manager

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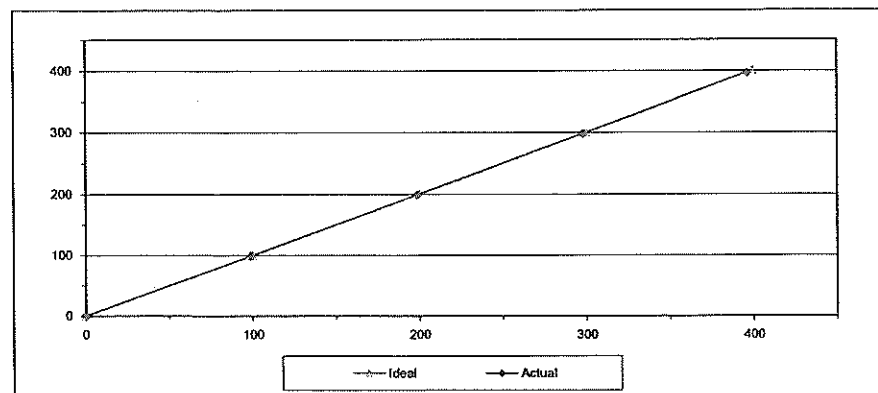
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	VX4SDB2M	Equipment ID	RYG_FS0451
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	297.90	-2.10	-0.70
4	400.00	396.20	-3.80	-0.95
AVERAGE (%)				-0.73



Calibrated By

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

Approved By

( Mr. Sarayuth Jitranont )  
Assistant General Manager

ALS Laboratory Group

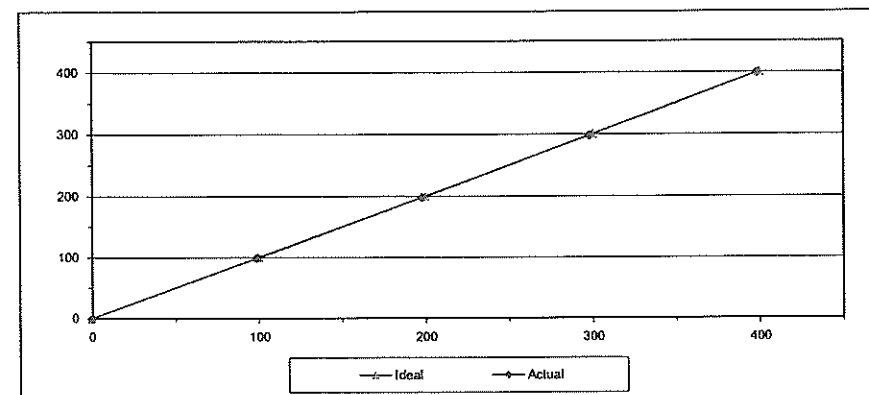
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	YD1WSD2G	Equipment ID	BKK_FS0786
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.80	-1.20	-1.20
2	200.00	197.80	-2.20	-1.10
3	300.00	298.20	-1.80	-0.60
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.64



Calibrated By

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

Approved By

( Mr. Sarayuth Jitranont )  
Assistant General Manager

ALS Laboratory Group

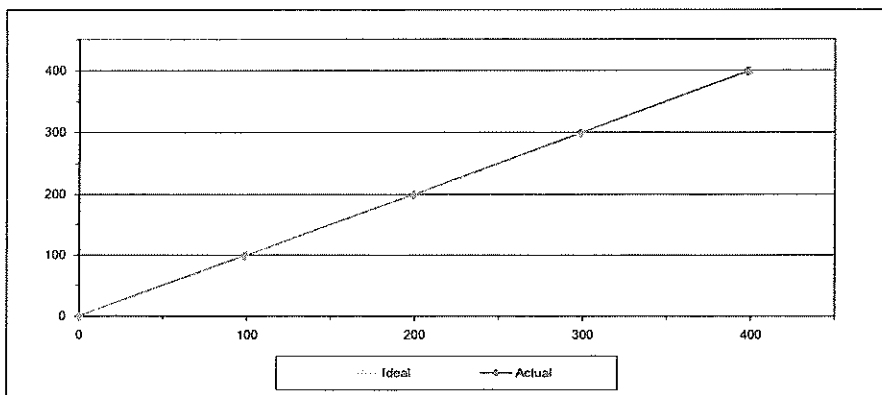
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	Teledyne API	Model	300E
Serial No.	1759	Equipment ID	BKK_FS0731
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.50	-1.50	-1.50
2	200.00	199.30	-0.70	-0.35
3	300.00	298.50	-1.50	-0.50
4	400.00	398.40	-1.60	-0.40
AVERAGE (%)				-0.53



Calibrated By

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

Approved By

( Mr. Sarayuth Jitranont )  
Assistant General Manager

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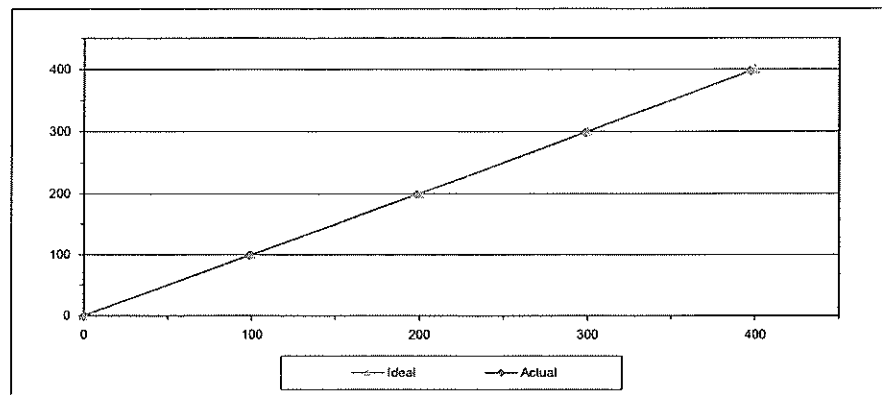
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	SLWK5D7G	Equipment ID	BKK_FS0790
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	298.50	-1.50	-0.50
4	400.00	397.00	-3.00	-0.75
AVERAGE (%)				-0.64



Calibrated By

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Field Environmental Scientist (3)

Approved By

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Assistant General Manager

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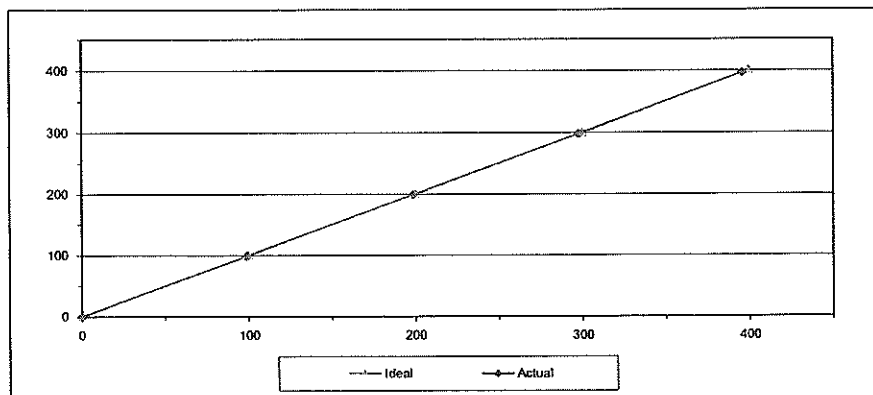
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## MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	8M404056	Equipment ID	BKK_FS1065
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	297.80	-2.20	-0.73
4	400.00	395.80	-4.20	-1.05
AVERAGE (%)				-0.75



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group

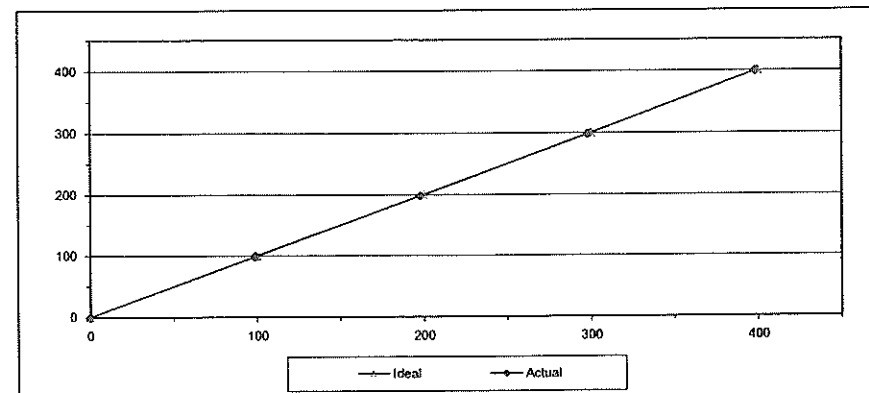
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	YD1WSD2G	Equipment ID	BKK_FS0786
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.80	-1.20	-1.20
2	200.00	197.80	-2.20	-1.10
3	300.00	298.20	-1.80	-0.60
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.64



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group

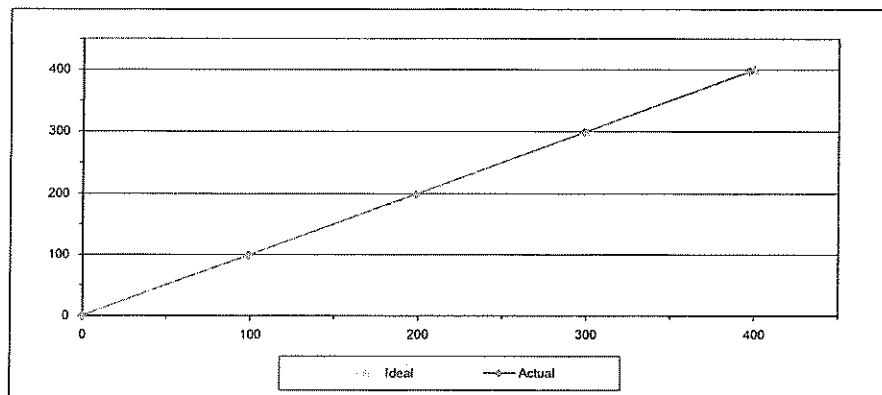
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	SLWK5D7G	Equipment ID	BKK_FS0790
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	298.50	-1.50	-0.50
4	400.00	397.00	-3.00	-0.75
AVERAGE (%)				-0.64



Calibrated By

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

Approved By

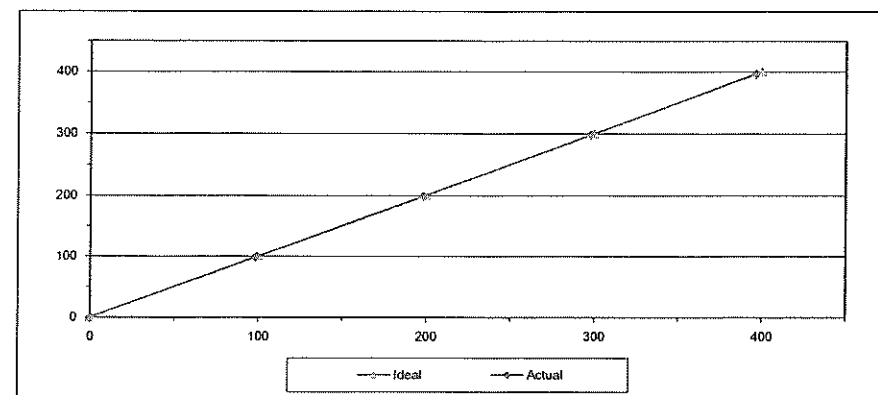
( Mr.Sarayuth Jitranont )  
Assistant General Manager



### MULTIPOINT CALIBRATION REPORT

Calibration Date	4-Jan-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	VX4SDB2M	Equipment ID	RYG_FS0451
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	297.90	-2.10	-0.70
4	400.00	396.20	-3.80	-0.95
AVERAGE (%)				-0.73



Calibrated By

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

Approved By

( Mr.Sarayuth Jitranont )  
Assistant General Manager

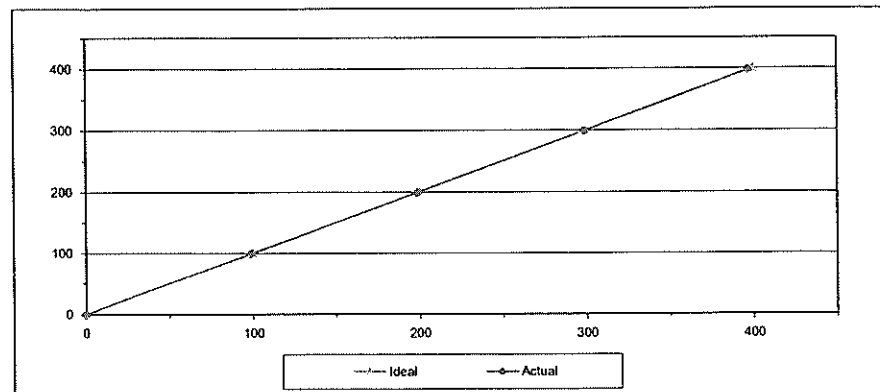




## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-23	Equipment Name	CO Analyzer
Manufacturer	HORIBA	Model	APMA-370
Serial No.	SLWK5D7G	Equipment ID	BKK_FS0790
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.22	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	98.70	-1.30	-1.30
2	200.00	198.50	-1.50	-0.75
3	300.00	298.50	-1.50	-0.50
4	400.00	397.00	-3.00	-0.75
AVERAGE (%)				-0.64



Calibrated By

*(Signature)*

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

Approved By

*(Signature)*

(Mr. Sarayuth Jittrantont)  
Assistant General Manager

ALS Laboratory Group

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



JIRANTEE ASSOCIATES CO., LTD.

Jirantee Associates Co., Ltd.  
66/14-15, 67/35-36  
Petra Kasem 7, 7/1, Rd. Watthapra, Bang Olay  
Bangkok 10600 (Thailand)  
Tel: +668898812  
Mobile: +6686399153  
E-mail: jnac@calibration@jiranatee.com  
Web site: www.jiranatee.com

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

Air speed measurement laboratory  
Calibration services department.

REVIEW BY: *(Signature)*  
APPROVED BY: *(Signature)*  
NEXT CAL. DATE: 28/12/24

Certificate Number

CL-007-65

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

### MEASUREMENT ITEM

### MANUFACTURER

### MODEL/TYPE

### SERIAL NUMBER

### ID NUMBER

### CONDITION AS-RECEIVED

### CUSTOMER

Cup anemometer  
: Novamix  
: Sensor: WS-02F  
Data logger: 200-WS-25L0  
: Sensor:  
Data logger: A4903  
: BKK\_FS0159  
: Used item  
: ALS laboratory group (Thailand) co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,  
Khet Suan Luang, Bangkok 10250 Thailand.

### RECEIVED DATE

### MEASUREMENT DATE

### ISSUE DATE

: 09 Nov 2022

: 23 Nov 2022

: 25 Nov 2022

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

### PLACE OF CALIBRATION

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

### CALIBRATION CONDITIONS

: Wind tunnel cross-section area<sup>1</sup> 900 cm<sup>2</sup>  
Win direction frontal area<sup>2</sup> 100 cm<sup>2</sup>  
Diameter of mounting pipe<sup>3</sup> - mm  
Blockage ratio of test object<sup>4</sup> 0.111 [-]

### Preconditioning

### Measurement Condition

: 24 hours at ambient conditions.

: The average values during measurement are (24.2) °C, (45.0) %RH and (1007.2) hPa.

### TABULATION OF RESULTS:

The table on next page give the measured values.

### Calibrated by:

(V) Mr. Sarawit Thachalad  
(T) Miss Itiraporn Lertsomphol



### Approved signatory:

Mr. Pailnya Booncharoen  
Calibration Department Manager

### Remark:

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

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

Certificate Number

CL-007-65

Page 2 of 2 Pages

MEASUREMENT RESULTS<sup>1</sup>

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 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

$V_{std}$ (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	$V_{UUC}$ (m/s)	Error (m/s)	$U$ (k=2) (m/s)
0.993	24.10	24.15	0.8	-0.2	0.16
2.054	24.24	24.15	1.9	-0.2	0.16
3.028	24.10	24.15	2.9	-0.1	0.22
4.220	24.14	24.15	3.9	-0.4	0.20
5.05	23.98	24.15	4.9	-0.2	0.17
6.04	24.30	24.15	5.9	-0.2	0.18
7.14	23.90	24.15	6.9	-0.2	0.19
8.27	24.24	24.15	8.0	-0.3	0.19
9.21	23.92	24.15	9.0	-0.2	0.23
10.20	24.10	24.15	9.9	-0.3	0.22
11.28	24.00	24.15	11.0	0.2	0.20
12.27	24.00	24.15	12.0	-0.2	0.24
13.34	23.96	24.15	13.1	-0.3	0.23
14.41	23.94	24.15	14.1	-0.3	0.22
15.40	23.94	24.15	15.1	-0.3	0.23
16.48	24.00	24.15	16.1	-0.4	0.24

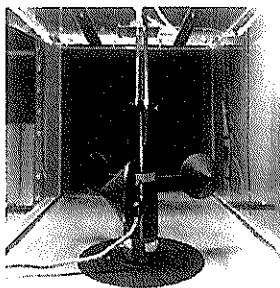
## Remark:

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

Velocity of standard

Velocity of Unit Under Calibration

## PHOTO OF CALIBRATION SET-UP



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



Jiranatee Associates Co. Ltd.  
63/14-15, 6/255-36  
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Mobile: +66 (0)9 099451  
E-mail: nac-calibration@jiranatee.com  
Web site: www.jiranatee.com

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

Air speed measurement laboratory  
Calibration services department.

Certificate Number

CL-007-65

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

## MEASUREMENT ITEM

: Wind Direction Sensor

## MANUFACTURER

: Novamx

## MODEL/TYPE

: Sensor: WS-02F

: Data logger: 200-WS-25LB

## SERIAL NUMBER

: Sensor: -

: Data logger: A4903

## ID NUMBER

: BKK\_FSO159

## CONDITION AS-RECEIVED

: Used item

## CUSTOMER

: ALS laboratory group (Thailand) co., ltd.  
104 Phatthanakan 4D, Phatthanakan Rd, Khwaeng Suan Luang,  
Khet Suan Luang, Bangkok 10250 Thailand.

## RECEIVED DATE

: 15 Nov 2022

## MEASUREMENT DATE

: 23 Nov 2022

## ISSUE DATE

: 25 Nov 2022

## ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature :  $23.0 \pm 3.0$  °C

Relative Humidity :  $55.0 \pm 15.0$  %RH

Atmospheric Pressure :  $1010 \pm 10$  hPa

## PLACE OF CALIBRATION

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

## CALIBRATION CONDITION

: Wind tunnel cross section area<sup>1</sup> 900 cm<sup>2</sup>: Win direction frontal area<sup>2</sup> 129 cm<sup>2</sup>: Diameter of mounting pipe<sup>3</sup> mm: Blockage ratio of test object<sup>4</sup> 0.143 [-]

## Preconditioning

: 24 hours at ambient conditions.

## Measurement Condition

: The average values during measurement are (24.5)°C, (44.0) %RH and (1009.5) hPa.

## TABULATION OF RESULTS:

The table on next page give the measured values.

## Calibrated by:

Pl. Mr. Surawit Thachalad  
Pl. Miss Jittaporn Lertsomphol



## Approved signatory:

Mr. Parinya Booncharoen  
Calibration Department Manager

## Remark:

<sup>1</sup> Nozzle cross-section area of the wind tunnel

<sup>2</sup> Projected cross-section area of the tested object include mounting pipe

<sup>3</sup> Diameter of mounting pipe

<sup>4</sup> Ratio  $\frac{A}{A_0}$

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

Certificate Number

CL-007-65

Page 2 of 2 Pages

MEASUREMENT RESULTS<sup>5</sup>

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 <sub>90°</sub> Degree (°)	D <sub>0°</sub> Degree (°)	Error Degree (°)	U (k=2) Degree (°)
5.05	0.001	0	0	0.58
	45.000	43	-2	0.76
	90.000	88	-2	0.74
	135.000	133	-3	0.76
	180.000	179	-1	0.68
	225.001	226	1	0.68
	270.000	271	1	0.74
	315.000	318	3	0.58

## Remark:

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

<sup>5</sup> Direction of standard

Direction of Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*



63/14-15,67/35-36, Soi Petchkasom 7/1, Petchkasom Rd,  
Wattapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com

## CERTIFICATE OF CALIBRATION

Certificate No: WS-01052022

Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.

Manufacturer : Data logger: Novolynx  
: Cup anemometer: Novolynx

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

Serial Number : Data logger: A4940  
: Cup anemometer: -

ID No : Data logger: BKH\_PS0166  
: Cup anemometer: -

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

Test Conditions : Wind tunnel cross test section area 900 cm<sup>2</sup>  
: Anemometer frontal area 100 cm<sup>2</sup>  
: Diameter of mounting pipe mm  
: Blockage ratio of test object 0.11 [-]

Test Conditions : Air temperature 26.3 ±0.8 °C  
: Air pressure 1013.3 ±0.4 hPa  
: Relative air humidity 51.1 ±3.5 %RH


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

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

Measurement Date : May 03, 2022.  
Issued Date : May 04, 2022.

Calibrated by  
☒ Mr. Soravil Thachalad  
☐ Mrs. Jitraporn Jaisornphol



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.



63/14-15,67/35-36, Soi Petchkasem 7/71, Petchkasem Rd,  
Walthapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranalee.com

Continuation of Certificate of Calibration Number

Certificate No: WS-01052022  
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment

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

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

V <sub>ref</sub> Reading m/s	V <sub>ref</sub> Reading m/s	Error (m/s)	Uncertainty (%)
2.019	2.0	0.1	2.4
4.145	4.0	0.1	1.2
6.01	6.0	0.0	1.0
8.01	8.0	0.0	0.74
10.00	10.0	0.2	0.68
11.99	12.0	0.2	0.72
14.02	14.0	0.3	0.47
16.00	16.0	0.3	0.43
18.02	18.0	0.3	0.65
19.99	20.0	0.1	0.51
21.01	21.0	0.2	0.63
23.01	23.0	0.1	0.69
25.01	25.0	0.0	0.90
27.05	27.0	0.1	0.86
29.09	29.0	0.0	1.7
31.02	31.0	0.2	4.8

UUC: Unit Under Calibration

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

#### Appendix 1: Instrumentation

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Pressure	TEDEA HUNTLEIGH	04352145	Aug 01, 2021	RAW 0034-21	5 - 30 m/s
2	Pressure differential sensor	TEDEA HUNTLEIGH	04352145	Aug 01, 2021	RAW 0034-21	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC	8445-12	Aug 18, 2021	RAW 0035-21	0 - 5 m/s
4	Temperature	TECH	DS18B20	Mar 30, 2022	CL 027-22	-30 - 70 °C
5	Relative humidity	TECH	DS18B20	Mar 30, 2022	CL 027-22	0 - 100 %RH
6	Atmospheric pressure	TECH	DS18B20	Mar 30, 2022	CL 027-22	500 - 1100 hPa
7	Wind tunnel	TECH	DS18B20	Mar 30, 2022	CL 027-22	0 - 50 ft/s

\*\*\*End of certificate of calibration\*\*\*



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Walthapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranalee.com

## CERTIFICATE OF CALIBRATION

Certificate No: WS-01052022

Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.

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

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

Serial Number : Data logger: A494Q  
: Wind direction sensor: -

ID No : Data logger: BKK\_F50165  
: Wind direction sensor: -

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

#### Environmental Condition:

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

#### Measurement Method:

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

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

#### Traceability:

The measurement results are traceable to the international system of units (SI) through Certificate No: Q21086014, Certificate No: WSG64/0025.

Measurement Date : May 03, 2022.

Issued Date : May 04, 2022.

Prepared by:  
☒ Mr. Saravit Thachas  
☐ Mrs. Jiraporn Lertkongkiet



Approved Signature:   
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.



63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,  
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Continuation of Certificate of Calibration Number

Certificate No: WD-01052022

Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment

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

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

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	41	-4	3.0
3		90	90	87	-3	3.0
4		135	135	132	-3	3.0
5		180	180	181	1	3.0
6		225	225	229	4	3.0
7		270	270	275	5	3.0
8		315	315	320	5	3.0
9	Counter Clockwise	0/360	360	359	-1	3.0
10		45	45	41	-4	3.0
11		90	90	87	-3	3.0
12		135	135	132	-3	3.0
13		180	180	181	1	3.0
14		225	225	229	4	3.0
15		270	270	275	5	3.0
16		315	315	320	5	3.0

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

\*\*\*End of Certificate of Calibration\*\*\*



Jiranatee Associates Co., Ltd.  
63/14 15, 67/35 36  
Petchkasem 7,7/1, Rd Wattthapra, Bangkokyai  
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Mobile : +66 86 3999454  
E-mail : jnac-calibration@jiranatee.com  
Web site : www.jiranatee.com

Accredited calibration laboratory  
ISO/IEC 17025:2017  
NSC-1151-115 17025  
CALIBRATION 0367

Air speed measurement laboratory  
Calibration services department

Signature: [Signature]  
Date: 17/11/24

Certificate Number

CL-001-65

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM  
MANUFACTURER  
MODEL/TYPE

SERIAL NUMBER

ID NUMBER  
CONDITION AS-RECEIVED  
CUSTOMER

RECEIVED DATE  
MEASUREMENT DATE  
ISSUE DATE

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

PLACE OF CALIBRATION

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

CALIBRATION CONDITION

Wind tunnel cross-section area<sup>1</sup> 900 cm<sup>2</sup>  
Win direction frontal area<sup>2</sup> 129 cm<sup>2</sup>  
Diameter of mounting pipe<sup>3</sup> - mm  
Blockage ratio of test object<sup>4</sup> 0.143 (-)

Preconditioning

24 hours at ambient conditions.

Measurement Condition

The average values during measurement are (24.0)°C, (49.7) %RH and (1009.5) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

1) Mr. Sorawit Thachalad  
2) Miss Jitraporn Lertsunphol



Approved signatory:

Mr. Panyaya Booncharoen  
Calibration Department Manager

Remark:

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

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IN WRITING FROM THE LABORATORY

Certificate Number

CL-001-65

Page 2 of 2 Pages

MEASUREMENT RESULTS<sup>4</sup>

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	$D'_{15}$ Degree (°)	$D'_{45}$ Degree (°)	Error Degree (°)	$U (k=2)$ Degree (°)
4.99	0.001	0	0	0.58
	45.001	45	0	0.68
	90.000	89	-1	0.74
	135.000	133	-2	0.74
	180.000	177	-3	0.68
	225.000	223	-2	0.74
	270.001	271	1	0.63
	315.001	318	3	0.68

## Remark:

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

Direction of standard:

Direction of Unit Under Calibration:

\*\* End of Certificate of Calibration \*\*



Jiramate Associates Co., Ltd.  
63/14-15, 67/35-36  
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Bangkok 10600 (Thailand)  
Tel: +66(0)25501117  
Mobile: +66(0)83399454  
E-mail: jac-calibration@jiranate.co.th  
Web site: www.jiranate.com

Accredited calibration laboratory  
ISO/IEC 17025:2017  
MSC-1151:115 1/2025  
CALIBRATION 0367

Air speed measurement laboratory  
Calibration services department

Certificate Number

CL-001-65

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM  
MANUFACTURER  
MODEL/TYPE

: Cup anemometer  
: Navalmx  
: Sensor: WS-02F  
Data logger: 110-WS-25DL-D

## SERIAL NUMBER

: Sensor: WSD-011  
Data logger: AS908

## ID NUMBER

: BKK\_FS1213

## CONDITION AS-RECEIVED

: New item

## CUSTOMER

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

## RECEIVED DATE

: 09 Nov 2022

## MEASUREMENT DATE

: 17 Nov 2022

## ISSUE DATE

: 23 Nov 2022

## ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

## PLACE OF CALIBRATION

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

## CALIBRATION CONDITIONS

: Wind tunnel cross-section area<sup>1</sup> 900 cm<sup>2</sup>  
Win direction frontal area<sup>1</sup> 100 cm<sup>2</sup>  
Diameter of mounting pipe<sup>1</sup> - mm  
Blockage ratio of test object<sup>4</sup> 0.111 [-]

## Preconditioning

: 24 hours at ambient conditions.

## Measurement Condition

: The average values during measurement are (23.6) °C, (49.5) %RH and (1012.2) hPa

## TABULATION OF RESULTS:

The table on next page give the measured values.



## Calibrated by:

: Mr. Sorawat Thachalad  
: Miss Jitraporn Leitsamphol

## Approved signatory:

Mr. Parinya Boontharom  
Calibration Department Manager

## Remark:

<sup>1</sup> Nozzle cross-section area of the wind tunnel

<sup>2</sup> Projected cross-section area of the tested object include mounting pipe

<sup>3</sup> Diameter of mounting pipe

<sup>4</sup> Ratio<sup>2</sup> to<sup>3</sup>

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Certificate Number

CL-001-65

Page 2 of 2 Pages

MEASUREMENT RESULTS<sup>5</sup>

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 orifice. 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 <sub>std</sub> (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V <sub>UUC</sub> (m/s)	Error (m/s)	U (k=2) (m/s)
0.975	24.02	23.75	0.8	-0.2	0.16
2.073	23.54	23.75	1.8	-0.3	0.16
3.068	24.02	23.75	2.8	-0.2	0.21
4.180	23.84	23.75	3.8	0.3	0.20
5.01	23.92	23.75	4.8	-0.2	0.17
6.00	23.96	23.75	5.8	0.2	0.18
7.07	23.84	23.75	6.9	-0.2	0.19
8.20	23.86	23.75	7.9	-0.3	0.19
9.11	23.80	23.75	8.9	-0.2	0.22
10.10	23.92	23.75	9.8	-0.3	0.21
11.16	23.82	23.75	10.9	-0.2	0.20
12.14	23.96	23.75	11.9	-0.3	0.21
13.20	23.90	23.75	12.9	-0.3	0.21
14.27	23.94	23.75	14.0	-0.3	0.25
15.19	23.90	23.75	14.9	-0.2	0.22
16.32	23.90	23.75	16.1	-0.3	0.26

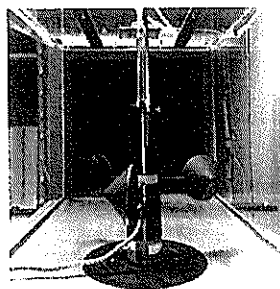
## Remark:

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

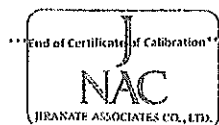
Velocity of standard

Velocity of Unit Under Calibration

## PHOTO OF CALIBRATION SET-UP



Calibration set up of the cup anemometer calibration in the wind tunnel of Jiranan 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.



63/14 15,67/35-36, Soi Petchkasem 7/1, Petchkasem Rd,  
Wallhapra, Bangkhosysai, Bangkok 10600 Thailand.

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## CERTIFICATE OF CALIBRATION

Certificate No.: CL 156 65  
Page 1 of 2

Equipment Name: Data Logger with Temperature  
Sensor

Manufacturer: Novajun  
Model: 110 WS 2501 D  
Serial No.: A590K  
ID No.: BKK FS1213

Customer  
Name: AIS laboratory group (Thailand) Co., Ltd.  
Address: 104 Phatthanakan 40, Phatthanakan  
Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok  
10250 Thailand.

Received date: 09 Nov 2022  
Calibration date: 1R Nov 2022  
Issue date: 23 Nov 2022

## Reference Used During Calibration

1. Standard Temperature Probe Model: STS 100 A500,  
Serial No.: 6R7682 09, Due date: 23 Mar 2023  
2. Digital Temperature Indicator Model: DH 1000 A MK  
II, Serial No.: G7 1407 00591 Due date: 22 July 2023

## Calibration Condition

Temperature: (23±3) °C  
Relative Humidity: (55±15)%

## Calibration Procedure

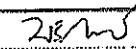
The temperature calibration was done by In-House  
calibration method as WI-CL-001 according to  
comparison method with standard digital temperature  
indicator and standard temperature probe. The  
temperature scale use was based on ITS 90

## Traceability

The measurement results are traceable to the  
international system of units (SI) through National  
Institute of Metrology Thailand (NIMT) Certificate  
number: TT 0034 22, Certificate number: CR-0092-  
22

Calibrated by  
Mr. Sorawit Thachalad  
Miss Jitraporn Tantisomphol



Approved Signatory:   
Mr. Patinya Booncharoen  
Calibration Department Manager

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OBTAINED IN WRITING FROM THE LABORATORY



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Certificate No. CI 1566  
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With adjustment

Calibration Range: 40-80 °C

#### Function:

This equipment was connected with temperature sensor Model: HMP60 S/N: U3641221.

Diameter: Diameter 12 mm Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	BUR Reading (°C)	Error (°C)	Uncertainty (°C)
60	40.00	39.9	0.1	0.30
60	50.00	49.8	0.2	0.30
60	60.00	59.8	0.2	0.30
60	70.00	69.6	0.4	0.30
60	80.00	79.5	0.5	0.30

#### UUC: Unit Under Calibration

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

✱ End of Certificate ✱



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## CERTIFICATE OF CALIBRATION

Calibration No. : RH-01112022  
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger  
Manufacturer : Novolynx  
Model/Type : 110 WS-25DE D  
Serial Number : A5908  
ID No. : BKK TS1213  
Customer : AIS laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Bhet Suan Luang, Bangkok  
10250 Thailand.

#### Environmental Conditions:

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 thermo hygrometer 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 MCS Calibration, Inc. Certificate number: 20314161. Due date: Mar 14, 2023.

Measurement Date : Nov 18, 2022  
Issued Date : Nov 23, 2022

#### Measurement Results:

This equipment was connected with indoor air quality probe and Displayed (RH) on display. Model: HMP60, Serial number: U3641221

Calibration was performed in the range of 20%RH to 80%RH

The results of calibration are reported in table below.

Determined (%RH)	Standard (%RH)	UUC (%RH)	Error (%RH)	Uncertainty ±(%RH)
20	19.93	17.6	2.3	0.61
50	50.45	47.7	2.8	0.67
80	80.30	77.6	2.7	0.65



Performed by  
☒ Mr. Sorawit Thachalad  
☐ Miss Jittaporn Lertsomphol

Approved Signatory:   
Mr. Pariny Booncharoen,  
Calibration Department Manager

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Jirunate Associates Co., Ltd.  
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Mobile : 0926199945  
E-mail : jirunate@jirunate.co.th  
Website : www.jirunate.co.th

Accredited calibration laboratory  
ISO/IEC 17025:2017  
NSC-154-15 17025  
CALIBRATION 0367

Air speed measurement laboratory  
Calibration services department

Manakorn P.

18/5/24

Certificate Number

CL-005-65

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

### MEASUREMENT ITEM

### MANUFACTURER

### MODEL/TYPE

### SERIAL NUMBER

### ID NUMBER

### CONDITION AS-RECEIVED CUSTOMER

: Wind Direction Sensor

: Novatymx

: Sensor: WS-02F

: Data logger: 110-WS-2501-D

: Sensor: WSD-015

: Data logger: AS907

: BKK\_FS1212

: New item

: ALS laboratory group (Thailand) co., Ltd  
104 Phatthanakan 4B, Phatthanakan Rd, Khwaeng Suan Luang,  
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 09 Nov 2022

MEASUREMENT DATE : 18 Nov 2022

ISSUE DATE : 23 Nov 2022

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

### PLACE OF CALIBRATION

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

### CALIBRATION CONDITION

Wind tunnel cross-section area<sup>1</sup> 900 cm<sup>2</sup>  
Win direction frontal area<sup>2</sup> 129 cm<sup>2</sup>  
Diameter of mounting pipe<sup>3</sup> - mm  
Blockage ratio of test object<sup>4</sup> 0.143 [-]

### Preconditioning

### Measurement Condition

: 24 hours at ambient conditions.

: The average values during measurement are (23.4)°C, (47.7) %RH and (1012.3) hPa

### TABULATION OF RESULTS:

The table on next page give the measured values

### Calibrated by:

1) Mr. Sorawit Thachalsat

1) Miss Intaraporn Lertsanaphol

Approved signatory

Mr. Panyo Booncharoen  
Calibration Department Manager



### Remark:

<sup>1</sup> Nozzle cross-section area of the wind tunnel

<sup>2</sup> Projected cross-section area of the tested object include mounting pipe

<sup>3</sup> Diameter of mounting pipe

<sup>4</sup> Ratio<sup>2</sup> to

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Page 2 of 2 Pages

### MEASUREMENT RESULTS<sup>5</sup>

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 <sub>rot</sub> Degree (°)	D <sub>enc</sub> Degree (°)	Error Degree (°)	U (k=2) Degree (°)
	0.001	0	0	0.58
	45.001	42	-3	0.58
	90.000	90	0	0.68
	135.000	135	0	0.58
5.02	180.000	181	1	0.68
	225.000	226	1	0.68
	270.001	270	0	0.68
	315.000	315	0	0.68

### Remark:

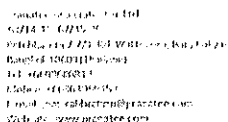
Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

Direction of standard

Direction of Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*





*An special measurement laboratory  
Calibration services department*

CL-005-6S

## Page 1 of 2 Pages

**CUSTOMER**

Khet Suan Luang, Bangkok 10250 Thailand

23 Nov 2022

Ambient condition in the laboratory are as follow:

104420

Eiffel-type wind tunnel of Branstetter Associates Co., Ltd

Wind tunnel cross-section area <sup>1</sup>	900	cm <sup>2</sup>
Win direction frontal area <sup>2</sup>	100	cm <sup>2</sup>
Diameter of mounting pipe <sup>3</sup>		mm
Blockage ratio of test object <sup>4</sup>	0.111	[-]

: 24 hours at ambient conditions

The average values during measurement are (23.9) °C, (48.8) %RH and (1010.7) hPa

The table on next page gives the measured values.

\* Mr. Sonzogni, Headmaster  
Miss Jateppara Irtisomphol

Mr. Parry's Recommendation  
 Calibration Department Manager

<sup>1</sup> 1801/2 <sup>2</sup> 1803/4

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Page 2 of 2 Pages

## MEASUREMENT RESULTS

The cup anemometer, used under calibration (URC) 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 and above 5 m/s to 10 m/s was calculated by a pitot tube with pitot-static differential pressure meter which was installed 40 mm and 300 mm respectively away from tunnel nozzle. URC was installed at the centre of the first section. The calibration was carried out under both rising and falling air velocity in the range of 3 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.

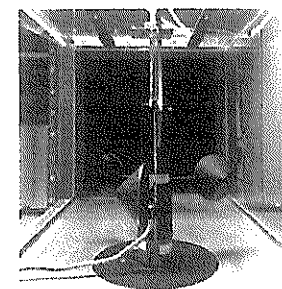
$V_{ind}$ (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	$V_{act}$ (m/s)	Error (m/s)	$U$ ( $k=2$ ) (m/s)
0.869	24.00	23.85	0.8	-0.2	0.20
2.033	23.76	23.85	1.9	-0.2	0.17
3.061	23.92	23.85	2.9	-0.2	0.19
4.174	23.90	23.85	4.0	0.2	0.20
5.08	23.82	23.85	5.0	-0.1	0.17
6.01	23.98	23.85	5.9	-0.1	0.20
7.07	23.80	23.85	6.9	-0.2	0.22
8.18	23.98	23.85	8.0	-0.2	0.24
9.10	23.80	23.85	8.9	-0.2	0.20
10.11	23.94	23.85	9.9	-0.2	0.20
11.16	23.60	23.85	11.1	-0.1	0.20
12.14	23.92	23.85	12.0	0.2	0.22
13.22	23.62	23.85	13.0	-0.2	0.26
14.26	23.80	23.85	14.1	-0.2	0.25
15.25	23.70	23.85	15.1	0.2	0.25
16.31	23.78	23.85	16.1	-0.2	0.26

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

Velocity of standard

### Velocity of Hail Under Calibration

## PHOTO OF CALIBRATION SET-UP



Calibration set up of the cup anemometer calibration in the wind tunnel of Jizunite 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.





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## CERTIFICATE OF CALIBRATION

Calibration No. PH-05112022  
Page 1 of 1 Pages

Measurement Item: Relative Humidity with 4th digit  
Manufacturer: Novolyne  
Model/Type: J10 WS 25DL D  
Serial Number: A5901  
ID No.: BKR TS1212  
Customer: ALS laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Soan Luang, Khet Soan Luang, Bangkok 10250 Thailand

### Environmental Condition:

The measurement was carried out in an ambient temperature of (25±3) °C, and relative humidity of (60±15)%

### Measurement Method:

Unit Under Calibration (UUC) was calibrated by comparison method with standard thermal hygrometer as 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 JAC Calibration, Inc. Certificate number 20314 161 Due date: Mar 14, 2023

Measurement Date: Nov 18, 2022  
Issued Date: Nov 23, 2022

### Measurement Results:

This equipment was connected with indoor air quality probe and displayed (RH) on display. Model: HM160, Serial number: U3641224

Calibration was performed in the range of 20%RH to 80%RH

The results of calibration are reported in table below

Determined (%RH)	Standard (provided) (%RH)	UUC (measured) (%RH)	Error (%RH)	Uncertainty (%RH)
20	20.04	18.3	-1.7	0.52
50	50.28	48.3	-2.0	0.52
80	80.27	78.9	-1.4	0.52

Performed by:  
☒ Mr. Sorawit Thachalad  
☐ Miss Jitraporn Uertsomphol



Approved Signatory:   
Mr. Parinya Booncharoen  
Calibration Department Manager

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Walthapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranalee.com



## CERTIFICATE OF CALIBRATION

Certificate No. CL 160-65  
Page 1 of 2

Equipment Name: Data Logger with Temperature Sensor  
Manufacturer: Novolyne  
Model: J10 WS 25DL D  
Serial No.: A5901  
ID No.: BKR TS1212

Customer Name: ALS laboratory group (Thailand) Co., Ltd.  
Address: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Soan Luang, Khet Soan Luang, Bangkok 10250 Thailand

Received date: 09 Nov 2022  
Calibration date: 18 Nov 2022  
Issue date: 23 Nov 2022

### Reference Used During Calibration

1. Standard Temperature Probe Model: S35 100 A500, Serial No.: 667682-09, Due date: 23 Mar 2023  
2. Digital Temperature Indicator Model: DT1 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 WCI-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: TI 0034 22, Certificate number: CR 0092 22

Calibrated by:  
by Mr. Sorawit Thachalad  
by Miss Jitraporn Uertsomphol



Approved Signatory:   
Mr. Parinya Booncharoen  
Calibration Department Manager

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Organization: 01-16065  
Page 1 of 2

Result of Calibration: 1. Within calibration 1. Within expectation  
Calibration Range: 20-40 °C

Location:  
The company of the concerned equipment is: 104 Phatthanakan Rd., 104 Phatthanakan Rd.,  
Bangkok, Thailand 10600

Temperature (°C)	Standard Reading (°C)	Diff. Reading (°C)	Unc. (°C)	Uncertainty (°C)
20	20.00	0.0	0.1	0.30
30	30.00	0.0	0.1	0.30
40	40.00	0.0	0.1	0.30
50	50.00	0.0	0.1	0.30
60	60.00	0.0	0.1	0.30

NOTE: This is a calibration

The report contains uncertainty and standard uncertainty multiplied by a coverage factor of 2 providing a level of confidence of approximately 95%

✱ End of Certificate ✱



## CERTIFICATE OF CALIBRATION

Certificate No.: CL-201-65  
Page 1 of 2

Equipment Name: Data Logger with Temperature  
Sensor  
Manufacturer: Novalynx  
Model: 200-WS-25LB  
Serial No.: A5263  
ID No.: BKK\_FS0910

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: 02 Dec 2022  
Calibration date: 10 Dec 2022  
Issue date: 12 Dec 2022

Reference Used During Calibration  
1. Standard Temperature Probe Model: STS-100 A500,  
Serial No.: 667682-09, Due date: 23 Mar 2023  
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-0034-22, Certificate number: ER-0092-  
22

Calibrated by  
☒ Mr. Sorawit Thachalao  
☐ Miss Jitraporn Lertsomphol

Approved Signatory:   
Mr. Parinya Booncharoen  
Calibration Department Manager



63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,  
Wathapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel.: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com



Certificate No.: CL-201-65  
Page 2 of 2

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

Function:  
This equipment was connected with temperature sensor Model: HMP60 S/N: N0330786.

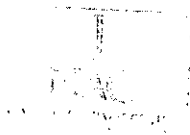
Dimension : Diameter 12 mm. Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	20.063	19.7	-0.4	0.099
60	25.057	24.7	-0.4	0.099
60	30.049	29.7	-0.3	0.099
60	35.043	34.7	-0.3	0.099
60	40.033	39.7	-0.3	0.099

UUC\*: Unit Under Calibration

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

\* End of Certificate \*



63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,  
Wathapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel.: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

## CERTIFICATE OF CALIBRATION

Calibration No. : RH-2012022  
Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger  
Manufacturer : Novalynx  
Model/Type : 200-WS-26LB  
Serial Number : A5263  
ID No. : BKK\_FS0910  
Customer : ALS laboratory group (Thailand) Co., Ltd.  
: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok  
10260 Thailand.

Environmental Condition:  
The measurement was carried out in an ambient temperature of  $(25 \pm 3)^\circ\text{C}$ , and relative humidity of  $(50 \pm 16)\%$ .

Measurement Method:  
Unit Under Calibration (UUC) was calibrated by comparison method with standard thermo hygrometer 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 MCS Calibration, Inc. Certificate number: 20314-101. Due date: Mar 14, 2023.

Measurement Date : Dec 10, 2022  
Issued Date : Dec 12, 2022

Measurement Results:  
This equipment was connected with indoor air quality probe and Displayed (UR) on display. Model: HMP60, Serial number: N0330786.  
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 $\pm$ (%RH)
20	19.98	18.2	-1.8	0.52
50	50.28	47.8	-2.4	0.54
80	80.38	77.4	-3.0	0.52

Performed by  
☒ Mr. Sorawit Thachetad  
☐ Miss Jitraporn Lertsomphol



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.



IRANATEE ASSOCIATES CO., LTD.

Jiranatee Associates Co., Ltd.  
63/14-15, 67/35-36  
Ferditasem 7./71, Rd. Watthapra, Bangkok,  
Bangkok 10620 (Thailand)  
Tel: +6608550812  
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E-mail: jnac-calibration@jiranatee.com  
Web site: www.jiranatee.com

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

Air speed measurement laboratory  
Calibration services department

Certificate Number

CL-014-65

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

### MEASUREMENT ITEM MANUFACTURER MODEL/TYPE

: Cup anemometer  
: Novalynx  
: Sensor: WS-02F  
Data logger: 200-WS-25LB

### SERIAL NUMBER

: Sensor: -  
Data logger: AS263

### ID NUMBER

: BKK\_FS0910

### 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

: 02 Dec 2022

### MEASUREMENT DATE

: 09 Dec 2022

### ISSUE DATE

: 12 Dec 2022

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature : 23.0 ± 3.0 °C  
Relative Humidity : 55.0 ± 15.0 %RH  
Atmospheric Pressure : 1010.1 hPa

### PLACE OF CALIBRATION

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

### CALIBRATION CONDITIONS

Wind tunnel cross-section area<sup>1</sup> 900 cm<sup>2</sup>  
Win direction frontal area<sup>2</sup> 100 cm<sup>2</sup>  
Diameter of mounting pipe<sup>3</sup> mm  
Blockage ratio of test object<sup>4</sup> 0.111 [-]

### Preconditioning

: 24 hours at ambient conditions.

### Measurement Condition

: The average values during measurement are (24.3) °C, (46.3) %RH and (1011.4) hPa.

### TABULATION OF RESULTS:

The table on next page give the measured values.

### Calibrated by:

☒ Mr. Sorawit Thechadad  
☐ Miss Jitraporn Lertsomphol

### Approved signatory:

Mr. Parinya Booncharoen  
Calibration Department Manager

### Remark:

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

Page 2 of 2 Pages

### MEASUREMENT RESULTS<sup>5</sup>

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 <sub>std</sub> (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V <sub>uuc</sub> (m/s)	Error (m/s)	U (k=2) (m/s)
0.977	24.18	24.25	0.8	-0.2	0.15
2.043	24.30	24.25	1.8	-0.2	0.16
3.068	24.10	24.25	2.9	-0.2	0.21
4.197	24.58	24.25	3.9	-0.3	0.19
5.02	24.06	24.25	4.8	-0.2	0.22
6.01	24.54	24.25	5.9	-0.1	0.18
7.06	23.94	24.25	6.8	-0.2	0.18
8.17	24.40	24.25	8.0	-0.2	0.18
9.11	23.90	24.25	9.0	-0.1	0.22
10.10	24.24	24.25	10.0	-0.1	0.24
11.17	23.88	24.25	11.0	-0.1	0.24
12.16	24.16	24.25	12.0	-0.2	0.23
13.19	24.00	24.25	13.0	-0.2	0.25
14.25	24.10	24.25	14.1	-0.2	0.26
15.25	24.06	24.25	15.1	-0.1	0.24
16.31	24.08	24.25	16.1	-0.3	0.35

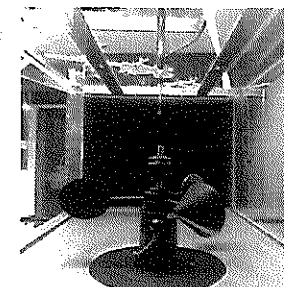
### Remark:

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

<sup>6</sup> Velocity of standard

<sup>7</sup> Velocity of Unit Under Calibration

### PHOTO OF CALIBRATION SET-UP



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

\*\*\*End of Certificate of Calibration\*\*\*

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

Certificate Number

CL-014-65

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

**MEASUREMENT ITEM** : Wind Direction Sensor  
**MANUFACTURER** : Novalynx  
**MODEL/TYPE** : Sensor: WS-02F  
Data logger: 200-WS-25LB  
**SERIAL NUMBER** : Sensor: -  
Data logger: AS263  
**ID NUMBER** : BKK\_FS0910  
**CONDITION AS-RECEIVED** : Used Item  
**CUSTOMER** : A1S laboratory group (Thailand) co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,  
Khet Suan Luang, Bangkok 10250 Thailand.

**RECEIVED DATE** : 02 Dec 2022  
**MEASUREMENT DATE** : 12 Dec 2022  
**ISSUE DATE** : 12 Dec 2022

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

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

**CALIBRATION CONDITION**

Wind tunnel cross-section area <sup>1</sup>	900	cm <sup>2</sup>
Win direction frontal area <sup>2</sup>	129	cm <sup>2</sup>
Diameter of mounting pipe <sup>3</sup>	-	mm
Blockage ratio of test object <sup>4</sup>	0.143	[-]

**Preconditioning** : 24 hours at ambient conditions.  
**Measurement Condition** : The average values during measurement are (24.3)°C, (48.2) %RH and (1007.5) hPa.

### TABULATION OF RESULTS:

The table on next page give the measured values.

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



Approved signatory:

Mr. Parinya Booncharoen  
Calibration Department Manager

### Remark:

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

Certificate Number

CL-014-65

Page 2 of 2 Pages

### MEASUREMENT RESULTS<sup>5</sup>

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

Air speed	D' <sub>ind</sub>	D' <sub>unc</sub>	Error	U (k=2)
m/s	Degree (°)	Degree (°)	Degree (°)	Degree (°)
5.02	0.001	0	0	0.58
	45.000	41	-4	0.68
	90.000	87	-3	0.58
	135.000	135	0	0.74
	180.000	182	2	0.68
	225.001	227	2	0.68
	270.000	274	4	0.68
	315.000	319	4	0.74

### Remark:

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

<sup>6</sup> Direction of standard

<sup>7</sup> Direction of Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*



# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACC22043  
Pages : 1 of 3

## Calibration Certificate

Equipment : SOUND CALIBRATOR  
Manufacturer : RION  
Model : NC-74  
Serial No.: 34178118  
ID No.: BKK\_FS0631

Condition As Found : GOOD

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

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

Received Date : 07 DECEMBER 2022  
Calibration Date : 20 DECEMBER 2022  
Date of Issue : 21 DECEMBER 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchurai*  
( Thanakul Petchurai )

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

# SITHIPORN SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACC22043  
Job No. : VC66AC0016  
Pages : 2 of 3

Calibration Procedure : CP-AC-03

### Calibration Method :

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

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

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

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

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

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

3.1 National Institute of Metrology (Thailand).

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

*T. Petchurai*



SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22043  
Job No. : VC66AC0016  
Pages : 3 of 3

**Result of calibration :**

**1. Sound pressure level**

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.13	0.13	0.14	0.40

**2. Frequency**

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1001.7	0.2	0.1	1.0

**3. Total distortion**

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
2.13	0.10	3.0

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

End of Calibration Certificate

*T. Petchurai*

SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

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



Cert. No. : ACL22251  
Pages : 1 of 8

**Calibration Certificate**

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00858516 / 158777 / 58778  
ID No.: BKK\_FS0106

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 : 01 NOVEMBER 2022  
Calibration Date : 02-03 NOVEMBER 2022  
Date of Issue : 04 NOVEMBER 2022

REVIEW BY	<i>Maken P.</i>
APPROVED BY	<i>h. k.</i>
NEXT CAL. DATE	3/11/23

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchurai*  
( Thanakul Petchurai )

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

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22251  
Job No. : VC66AC0004  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

**Calibration Method :**

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62190114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

*J. Retah*

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22251  
Job No. : VC66AC0004  
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

*J. Retah*

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22251  
Job No. : VC66AC0004  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

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

**2. Self-generated noise**

2.1 Normal test

Measured Value ( dB )
16.8

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

Frequency Weighting	Measured value ( dB )
A - weight	9.9
C - weight	16.6
Flat	22.5

**3. Acoustical signal tests of frequency weightings**

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.8	0.8	0.8	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-2.6	-2.5	-2.5	±5.0

*T. R. H.*

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22251  
Job No. : VC66AC0004  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

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

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

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

**6. Long - term stability**

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

*T. R. H.*

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22251  
Job No. : VC66AC0004  
Pages : 6 of 8

7. Level linearity on the reference level range

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

*T. Petch*

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Continuation of Calibration Certificate

Cert. No. : ACL22251  
Job No. : VC66AC0004  
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±3.0

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

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Continuation of Calibration Certificate

Cert. No. : ACL22251  
Job No. : VC66AC0004  
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

T. Petchurai

SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

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



Cert. No. : ACL22302  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00858521 / 158765 / 58767  
ID No.: BKK\_FS0111

Condition As Found : GOOD

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

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

Received Date : 07 DECEMBER 2022  
Calibration Date : 16-20 DECEMBER 2022  
Date of Issue : 21 DECEMBER 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai  
( Thanakul Petchurai )

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

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Continuation of Calibration Certificate

Cert. No. : ACL22302  
Job No. : VC66AC0016  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

T. P. P. P.

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Continuation of Calibration Certificate

Cert. No. : ACL22302  
Job No. : VC66AC0016  
Pages : 3 of 8

Summary of Measurement Result :

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

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Continuation of Calibration Certificate

Cert. No. : ACL22302  
Job No. : VC66AC0016  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

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

**2. Self-generated noise**

2.1 Normal test

Measured Value ( dB )
14.8

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

Frequency Weighting	Measured value ( dB )
A - weight	11.6
C - weight	18.1
Flat	23.8

**3. Acoustical signal tests of frequency weightings**

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.4	± 1.5
1000	0.1	0.0	0.0	± 1.0
8000	-1.9	-1.8	-1.8	±5.0

*T. Retina*

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Continuation of Calibration Certificate

Cert. No. : ACL22302  
Job No. : VC66AC0016  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

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

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

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Lcq	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. Retina*

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Continuation of Calibration Certificate

Cert. No. : ACL22302  
Job No. : VC66AC0016  
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	84.1	0.1	± 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	34.0	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	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

*T. Petch*

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Continuation of Calibration Certificate

Cert. No. : ACL22302  
Job No. : VC66AC0016  
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.4	-1.0	±3.0

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

*T. Petch*



Continuation of Calibration Certificate

Cert. No. : ACL22302  
Job No. : VC66AC0016  
Pages : 8 of 8

11. Overload indication

Measured value ( dB )		Deviated Value	Acceptance Limits
Positive one-half cycle	Negative one-half cycle	( dB )	( dB )
89.7	89.7	0.0	±1.5

12. High level stability

Frequency	SLM Display at initial	SLM Display at final	Deviated Value	Acceptance Limits
Weighting	( 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

T. Petchurai

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



Cert. No. : ACL23007  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00858527 / 158778 / 58779  
ID No.: BKK\_FS0117

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 : 14 DECEMBER 2022  
Calibration Date : 03-05 JANUARY 2023  
Date of Issue : 06 JANUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai  
( Thanakul Petchurai )

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

Continuation of Calibration Certificate

Cert. No. : ACL23007  
Job No. : VC66AC0021  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

*Signature*

Continuation of Calibration Certificate

Cert. No. : ACL23007  
Job No. : VC66AC0021  
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

*Signature*

Continuation of Calibration Certificate

Cert. No. : ACL23007  
Job No. : VC66AC0021  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

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

**2. Self-generated noise**

2.1 Normal test

Measured Value ( dB )
17.1

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

Frequency Weighting	Measured value ( dB )
A - weight	15.8
C - weight	22.0
Flat	27.6

**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	1.1	1.1	1.1	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	-1.6	-1.5	-1.5	±5.0

~ P. 1

Continuation of Calibration Certificate

Cert. No. : ACL23007  
Job No. : VC66AC0021  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.1	±2.0
4000	0.0	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	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

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

**6. Long - term stability**

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

~ P. 2

Continuation of Calibration Certificate

Cert. No. : ACL23007  
Job No. : VC66AC0021  
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	25.0	0.0	± 1.1

7 P. 6/6

Continuation of Calibration Certificate

Cert. No. : ACL23007  
Job No. : VC66AC0021  
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ~ 5.0
	2	8	117.0	117.0	0.0	1.0 ~ 2.5
	200	800	134.0	134.1	0.1	± 1.0
Slow	2	8	108.0	108.0	0.0	1.5 ~ 5.0
	200	800	127.6	127.6	0.0	± 1.0
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	-
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	-
Positive half cycle	135.4	135.1	-0.3	± 2.0
Negative half cycle	135.4	135.1	-0.3	± 2.0

7 P. 6/6

Continuation of Calibration Certificate

Cert. No. : ACL23007  
Job No. : VC66AC0021  
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

*T. Petchurai*

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



Cert. No. : ACL22244  
Pages : 1 of 8

Calibration Certificate

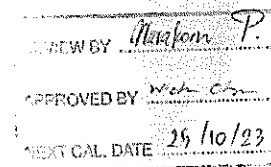
Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00572552 / 170384 / 72890  
ID No.: BKK\_FS0877

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 2022  
Calibration Date : 25-26 OCTOBER 2022  
Date of Issue : 27 OCTOBER 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchurai*  
( Thanakul Petchurai )

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

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22244  
Job No. : VC65AC0090  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

*T. Petch*

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Continuation of Calibration Certificate

Cert. No. : ACL22244  
Job No. : VC65AC0090  
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

*T. Petch*

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert No. : ACL22244  
Job No. : VC65AC0090  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

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

**2. Self-generated noise**

2.1 Normal test

Measured Value ( dB )
14.8

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

Frequency Weighting	Measured value ( dB )
A - weight	11.6
C - weight	17.5
Flat	23.3

**3. Acoustical signal tests of frequency weightings**

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.4	0.4	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-1.7	-1.6	-1.6	±5.0

*F. Petch.*

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Continuation of Calibration Certificate

Cert No. : ACL22244  
Job No. : VC65AC0090  
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	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

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

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

**6. Long - term stability**

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

*F. Petch.*

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Continuation of Calibration Certificate

Cert. No. : ACL22244  
Job No. : VC65AC0090  
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

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Continuation of Calibration Certificate

Cert. No. : ACL22244  
Job No. : VC65AC0090  
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

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

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

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Continuation of Calibration Certificate

Cert. No. : ACL22244  
Job No. : VC65AC0090  
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

T. Petchurai

SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

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



Cert. No. : ACL22232  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00584982 / 157781 / 48096  
ID No.: BKK\_FS0925

Condition As Found : GOOD

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

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

Received Date : 03 OCTOBER 2022  
Calibration Date : 18-19 OCTOBER 2022  
Date of Issue : 20 OCTOBER 2022

CREATED BY	Nathakorn P.
APPROVED BY	Nichol Chan
NEXT CAL. DATE	18/10/23

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai  
( Thanakul Petchurai )

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

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22232  
Job No. : VC65AC0088  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

**Calibration Method :**

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

*T. Pichan*

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22232  
Job No. : VC65AC0088  
Pages : 3 of 8

**Summary of Measurement Result :**

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

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Continuation of Calibration Certificate

Cert. No. : ACL22232  
Job No. : VC65AC0088  
Pages : 4 of 8

**Result of calibration :**

**1. Absolute sensitivity**

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

**2. Self-generated noise**

2.1 Normal test

Measured Value ( dB )
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	13.1
C - weight	19.0
Flat	24.7

**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	0.3	0.3	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.5	-0.4	-0.4	±5.0

*T. Petch*

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22232  
Job No. : VC65AC0088  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

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

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

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

**6. Long - term stability**

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

*T. Petch*

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Continuation of Calibration Certificate

Cert. No. : ACL22232  
Job No. : VC65AC0088  
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

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Continuation of Calibration Certificate

Cert. No. : ACL22232  
Job No. : VC65AC0088  
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
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, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
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	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

T. Petch.

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**CALIBRATION LABORATORY**

Continuation of Calibration Certificate

Cert. No. : ACL22232  
 Job No. : VC65AC0088  
 Pages : 8 of 8

11. Overload indication

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

12. High level stability

Frequency Weighting	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. Petchurai*

**SITHIPORN ASSOCIATES CO.,LTD.**  
**CALIBRATION LABORATORY**

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



Cert. No. : ACC22042  
 Pages : 1 of 3

**Calibration Certificate**

Equipment : SOUND CALIBRATOR  
 Manufacturer : RION  
 Model : NC-74  
 Serial No.: 34425567  
 ID No.: BKK\_FS0618

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 : 30 NOVEMBER 2022  
 Calibration Date : 07 DECEMBER 2022  
 Date of Issue : 12 DECEMBER 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchurai*  
 ( Thanakul Petchurai )

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

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22042  
Job No. : VC66AC0015  
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	33461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

T. Retoh

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Continuation of Calibration Certificate

Cert. No. : ACC22042  
Job No. : VC66AC0015  
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.05	0.05	0.15	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1003.7	0.4	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.70	0.10	3.0

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

End of Calibration Certificate

T. Retoh

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL23051  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00296513 / 179115 / 87522  
ID No.: BKK\_FS0970

Condition As Found : GOOD

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

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

Received Date : 17 JANUARY 2023  
Calibration Date : 19-20 JANUARY 2023  
Date of Issue : 23 JANUARY 2023

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.

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23051  
Job No. : VC66AC0026  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

### Calibration Method :

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

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

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

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

*T. Petchurai*

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23051  
Job No. : VC66AC0026  
Pages : 3 of 8

Summary of Measurement Result :

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

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Continuation of Calibration Certificate

Cert. No. : ACL23051  
Job No. : VC66AC0026  
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	16.8
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	0.1	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.4	-0.3	-0.3	±5.0

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Continuation of Calibration Certificate

Cert. No. : ACL23051  
Job No. : VC66AC0026  
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	0.1	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	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

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Continuation of Calibration Certificate

Cert. No. : ACL23051  
Job No. : VC66AC0026  
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

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Continuation of Calibration Certificate

Cert. No. : ACL23051  
Job No. : VC66AC0026  
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	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	-
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	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23051  
Job No. : VC66AC0026  
Pages : 8 of 8

11. Overload indication

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

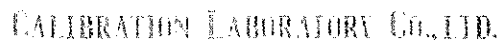
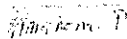
12. High level stability

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

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

End of Calibration Certificate

T. Petch

[illegible]

~~100%~~

4 13 194

# CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	VIBROCK
MODEL / TYPE	:	V901
SERIAL NO.	:	H22[BKIC_F50857]
CHID. NO.	:	251600663
JOB CONTROL NO.	:	221229131211

CUSTOMER : A.S. LABORATORY GROUP (THAILAND) CO., LTD.  
184 PHA THANAKAN 40, PHA THANAKAN RD.,  
KHWAENG PHA THANAKAN, KHET SUAN LUANG, BANGKOK 10250, THAILAND

DATE OF RECEIVED : 29 December 2022 DATE OF ISSUED : 05 January 2023

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer

$$d = \frac{1}{2}$$


Approved By : Mongkol Yutsontorn  
Authorized Signatory  
05 January 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. Q22131211

F3-011-0.4/01-12

page 1 of 3



CALIBRATION LABORATORY CO., LTD.

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## REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	VIBROCK
MODEL / TYPE	:	V901
SERIAL NO.	:	1822[BKK_FS0857]
DATE OF CALIBRATION	:	04 January 2023

ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2)^\circ\text{C}$                       Relative Humidity :  $(55 \pm 15)\% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, High Resolution Programmable Timer Counter.

Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd

REFERENCE STANDARD USED :

1. Digital Multimeter, Agilent Technologies Model 34401A S/N. US3604680.
2. High Resolution Programmable Tuner-Counter, Philips Model PM6680B S/N. SM607101.
3. Accelerometer with Measuring Amplifier, Brüel & Kjær Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. F-F-0180-22, Due Date 15 September 2023.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0001-22, Due Date 22 February 2023
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k \approx 2.80$  which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 XI:2021)"

Certificate No. Q22131211

FD-302 (Rev. 12-13-60)

page 2 of 3





การสอบเทียบเครื่องวัดความเร่ง  
CALIBRATION LABORATORY CO., LTD.  
2/10-11,14,55 Soi Prasert Manokit 29 Yeak 4, Prasert Manokit Rd., Ladphrae, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sals@cal-laboratory.com

02011  
02-01-12

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

#### CALIBRATION DATA

#### ACCELERATION RESULT

Test point		Model	STD Reading	DUP Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
1	160 Hz	m	1.00	1.16	-0.16	1.3
2	160 Hz		2.00	2.26	-0.26	1.0
3	160 Hz		3.00	3.30	-0.30	0.9
4	160 Hz		4.00	4.49	-0.49	0.9
5	160 Hz		5.00	5.45	-0.45	0.9
10	160 Hz		10.0	10.9	-0.9	1.0

This report is valid for the above stated instrument only

32 of End of Certificate 32

Certificate No. Q22131214

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F3-011-02-01-12



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Accredited  
ISO/IEC 17025

CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manokit 29 Yeak 4, Prasert Manokit Rd., Ladphrae, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sals@cal-laboratory.com

REVIEW BY *Mongkol P.*  
APPROVED BY *[Signature]*  
EFFECTIVE DATE 16/11/23

## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER

MANUFACTURER : VIBROCK

MODEL / TYPE : V901

SERIAL NO. : 1617 [BKK\_FS0855]

CLID. NO. : 25130427

JOB CONTROL NO. : 220512048093

CUSTOMER : ALS LABORATORY GROUP (THAILAND) CO., LTD.

104 PHATTHANAKAN 40, PHATTHANAKAN RD.,

KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK 10250, THAILAND

DATE OF RECEIVED : 12 May 2022

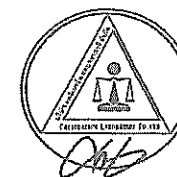
DATE OF ISSUED : 18 May 2022

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer

*[Signature]*

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
18 May 2022



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. Q22048093

F3-011-04/01-12

page 1 of 3



F3-011-04/01-12



# CALIBRATION LABORATORY Co., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com

## REPORT OF CALIBRATION FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : VIBROCK  
MODEL / TYPE : V901  
SERIAL NO. : 1617 [BKK\_FS0855]  
DATE OF CALIBRATION : 16 May 2022

### ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2) ^\circ\text{C}$  Relative Humidity :  $(55 \pm 15) \% \text{RH}$

### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, High Resolution Programmable Timer/Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. Digital Multimeter, Hewlett Packard Model 34401A S/N. 3146A75935.
2. High Resolution Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Portable Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.

### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0112-21, Due Date 26 October 2022.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0001/22, Due Date 22 February 2023.
3. The measurements are traceable to International System of Units (SI), through The Modal Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2021)"

Certificate No. Q22048093

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www.calibration



# CALIBRATION LABORATORY Co., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

### CALIBRATION DATA

#### ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( g )	( frequency )		( g )	( g )	( g )	$\pm$ ( % of rdg. )
1	160 Hz	rms	1.00	1.02	-0.02	1.2
2	160 Hz		2.00	2.10	-0.10	1.0
4	160 Hz		4.00	4.14	-0.14	0.9
6	160 Hz		6.00	6.18	-0.18	0.9
8	160 Hz		8.00	8.24	-0.24	0.9
10	160 Hz		10.0	10.3	-0.3	1.0

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

### End of Certificate ###

Certificate No. Q22048093

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www.calibration



# CALIBRATION LABORATORY CO., LTD.

210-11-14-55 Soi Phraet Manul 29 Yaek 4, Phraet Manul Rd., Ladphrao, Bangkok 10230  
Tel: 02-578-0353-4 Fax: 02-578-2672 www.calibration.co.th E-mail: info@calibration.co.th

REVIEWED: *Naom P.*  
DATE: *1/8/24*

## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : VIBROCK  
MODEL / TYPE : 901  
SERIAL NO. : 1852[BKK\_FS0858]  
CLID. NO. : 251700179  
JOB CONTROL NO. : 230131010361

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

DATE OF RECEIVED : 31 January 2023

DATE OF ISSUED : 03 February 2023

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer



Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
03 February 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. Q23010361

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# CALIBRATION LABORATORY CO., LTD.

210-11-14-55 Soi Phraet Manul 29 Yaek 4, Phraet Manul Rd., Ladphrao, Bangkok 10230  
Tel: 02-578-0353-4 Fax: 02-578-2672 www.calibration.co.th E-mail: info@calibration.co.th

## REPORT OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : VIBROCK  
MODEL / TYPE : 901  
SERIAL NO. : 1852[BKK\_FS0858]  
DATE OF CALIBRATION : 01 February 2023

#### ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(55 \pm 15) \% \text{RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline. The calibration was performed by using Digital Multimeter, High Resolution Programmable Timer/Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

- Digital Multimeter, Agilent Technologies Model 34401A S/N. US36044686.
- High Resolution Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 243-988.

#### TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0100-22, Due Date 15 September 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0001/22, Due Date 22 February 2023.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2021)"

Certificate No. Q23010361

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# CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukul 29 Yeak 4, Prasert Manukul Rd., Ladphrae, Bangkok 10230  
Tel: 02-578-0353-4 Fax: 02-578-2672 www.ccl-laboratory.com E-mail:sales@ccl-laboratory.com

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

## CALIBRATION DATA

### ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( g )	( frequency )		( g )	( g )	( g )	$\pm$ ( % of rdg. )
1	160 Hz	rms	1.00	1.16	-0.16	1.2
2	160 Hz		2.00	2.16	-0.16	1.0
4	160 Hz		4.00	4.32	-0.32	0.9
6	160 Hz		6.00	6.40	-0.40	0.9
8	160 Hz		8.00	8.48	-0.48	0.9
10	160 Hz		10.0	10.6	-0.6	1.0

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

### End of Certificate ###

Certificate No. Q23010361

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# CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukul 29 Yeak 4, Prasert Manukul Rd., Ladphrae, Bangkok 10230  
Tel: 02-578-0353-4 Fax: 02-578-2672 www.ccl-laboratory.com E-mail:sales@ccl-laboratory.com

REVIEW BY	<i>Nirakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	26/11/23

## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : VIBROCK  
MODEL / TYPE : V901  
SERIAL NO. : 1618 [BKK\_FS0856]  
CLID. NO. : 25130428  
JOB CONTROL NO. : 220524052251

CUSTOMER : ALS LABORATORY GROUP (THAILAND) CO., LTD.

104 PHATTHANAKAN 40, PHATTHANAKAN RD.,

KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK 10250, THAILAND

DATE OF RECEIVED : 24 May 2022

DATE OF ISSUED : 27 May 2022

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

Calibrated By : Suwit Phuanbusabong  
Calibration Engineer

Approved By : Mongkol Yotsontorn  
Authorized Signatory  
27 May 2022



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. Q22052251

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## CALIBRATION LABORATORY CO., LTD.

2/10-11,14,35 Soi Prasert Manulit 29 Yeak 4, Prasert Manulit Rd., Ladphrao, Bangkok, 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com

### REPORT OF CALIBRATION FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : VIBROCK  
MODEL / TYPE : V901  
SERIAL NO. : 1618 [BKK\_FS0856]  
DATE OF CALIBRATION : 25 May 2022

#### ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2) ^\circ\text{C}$  Relative Humidity :  $(55 \pm 15) \% \text{RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEF-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, High Resolution Programmable Timer/Counter and Portable Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

1. Digital Multimeter, Agilent Technologies Model 34401A S/N. US36044686
2. High Resolution Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101
3. Portable Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424

#### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EF-0070-21, Due Date 23 July 2022.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0001/22, Due Date 22 February 2023.
3. The measurements are traceable to International System of Units (SI), through The Modal Shop, Inc. Certificate No. 2649.01, Due Date 10 November 2022.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2021)"

Certificate No. Q22052251

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## CALIBRATION LABORATORY CO., LTD.

2/10-11,14,35 Soi Prasert Manulit 29 Yeak 4, Prasert Manulit Rd., Ladphrao, Bangkok, 10230  
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

#### CALIBRATION DATA

#### ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( g )	( frequency )		( g )	( g )	( g )	$\pm$ ( % of rdg. )
1	160 Hz	rms	1.00	1.06	-0.06	1.3
2	160 Hz		2.00	2.08	-0.08	1.0
4	160 Hz		4.00	4.04	-0.04	0.9
6	160 Hz		6.00	5.96	+0.04	0.9
8	160 Hz		8.00	7.91	+0.09	0.9
10	160 Hz		10.00	9.86	+0.14	0.9

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

### End of Certificate ###

Certificate No. Q22052251

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# CALIBRATION LABORATORY Co., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com



## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : VIBROCK  
MODEL / TYPE : V9000  
SERIAL NO. : 2342  
CLID. NO. : 252200819  
JOB CONTROL NO. : 230314028551

CUSTOMER : OKLA TESTING & CONSULTING SERVICE CO., LTD.  
67/35-36, 3RD FLOOR, PHETKASEM 7/1 RD., WATTHAPRA,  
BANGKOKYAI, BANGKOK 10600 THAILAND

DATE OF RECEIVED : 14 March 2023

DATE OF ISSUED : 16 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 : Sattira Thongtirat  
Calibration Engineer



Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
16 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. Q23028551

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# CALIBRATION LABORATORY Co., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel: 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com



## REPORT OF CALIBRATION

### FOR

NOMENCLATURE : VIBRATION METER  
MANUFACTURER : VIBROCK  
MODEL / TYPE : V9000  
SERIAL NO. : 2342  
DATE OF CALIBRATION : 15 March 2023

#### ENVIRONMENT CONDITIONS :

Temperature :  $(23 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(55 \pm 15) \% \text{RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.  
The calibration was performed by using Digital Multimeter, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

- Digital Multimeter, Agilent Technologies Model 34401A S/N. US36044686.
- Universal Counter, HP Model 5315A S/N. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

#### TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0100-22, Due Date 15 September 2023.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0075/22, Due Date 27 July 2023.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0009-22, Due Date 22 June 2023.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.  
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23028551

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@calibration



CLC  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sales@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment

## CALIBRATION DATA

### VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
( mm/s )	( frequency )		( mm/s )	( mm/s )	( mm/s )	± ( % of rdg. )
10	160 Hz	peak	10.00	9.97	+0.03	1.8
20	160 Hz		20.00	19.90	+0.10	1.8
40	160 Hz		40.00	38.50	+1.50	1.0
60	160 Hz		60.00	57.75	+2.25	1.0
80	160 Hz		80.00	77.23	+2.77	1.0
100	160 Hz		100.00	97.96	+2.04	1.0

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 1 of 54

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

### End of Certificate ###

Certificate No. Q23028551

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## ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน



ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ เขตราชเทวี  
กรุงเทพมหานคร ๑๐๔๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด  
อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น  
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น  
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ  
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔  
ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร  
ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย)  
จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้  
ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑  
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒  
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ น้ำใต้ดิน  
จำนวน ๑๒๖ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน  
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๑ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ  
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ  
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์  
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

๐๒๒๒

(นายศิระ จันทร์เจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการการแพทย์  
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน  
ปฏิบัติการตามแบบฉบับกรมโรงงานอุตสาหกรรม

กองวิจัยและเฝ้าระวังมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๒๔๔ ๓๒๐๘ ๐ ๒๒๔๔ ๓๔๑๔

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพาพร จันทร์ปลั่ง

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๐

๒) นางสาวชัชฌิยา โกมารกุล ณ นคร

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๑

๓) นายศรายุทธ จิตรานนท์

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๒

๔) นางสาวกนกกร เอนก

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๑

๕) นายสุริยา สอนแก้ว

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๒

๖) นายวิชาญ ชุนทรดี

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๓

๐๒๒๒

(นายศิระ จันทร์เจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการการแพทย์  
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน  
ปฏิบัติการตามแบบฉบับกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑) ๑๐๖๔

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

๑) นางสาวจินดา ไชจุธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๘
๒) นางสาวสาวิตรี น้อยเสงี่ยม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๘
๓) นางสาวชนัญญาญจน์ อัมมขม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๐
๔) นางสาวนรินทร์ สายเส็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๕
๕) นางสาวนันทิต สมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๖
๖) นางสาวศรัณยา เกลิมธำรงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๗
๗) นางสาวสรวิทย์ มงคลจิระวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๘
๘) นางสาวศิริลักษณ์ หึงแพง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๒๐
๙) นายพนงศ์ จันทพูนธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๐๘
๑๐) นายบรรเศรษฐ์ โกมลาลัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๑
๑๑) นายธันวา จริยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๔
๑๒) นางสาวเกศรินทร์ แก้วมัน	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๖
๑๓) นางสาวสุวิมล ชัยเรืองวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๗
๑๔) นางสาวสุชาดา ธรรมถาวร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๘
๑๕) นางสาวเปมิกา ชัยเดชธนกุล	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๓
๑๖) นางสาวศศิธร หมูสวัสดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๔
๑๗) นางสาวเสาวลักษณ์ ภูณภาอำพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๕
๑๘) นายอภิสิทธิ์ สิงหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๖
๑๙) นายศักดิ์สิทธิ์ ไพศาลพิสุทธิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๗
๒๐) ว่าที่ร้อยตรีหญิง พรรณิภา จำเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๘
๒๑) นางจิตดา คำแก้ว	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๓๑
๒๒) นางสาวอรรพรรณ รักยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๕
๒๓) นางสาวพนรัตน์ แยมกรบานต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๘
๒๔) นายจุลเดช วารินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๐
๒๕) นางสาวดาญรัตน์ ร้องคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๑
๒๖) นายนคร สุขเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๒
๒๗) นายบัญชา นามเขตต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๓
๒๘) นายพรมมี ศรีปีนเนตร	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๕
๒๙) นายอุทิศ คุ้มลิ้ม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๖
๓๐) ว่าที่ร้อยตรี เฉลิมเกียรติ อมรศรีเสริม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๘
๓๑) นางสาววริยา สร้างนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๙
๓๒) นายอนุพงศ์ รัตนศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๓๐
๓๓) นางสาวจุฑารัตน์ โอนสินเทียมะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๒๔๒
๓๔) นางสาวจารุวรรณ พิมพ์อภัยฤทธิยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๖๐

(นายศิระ จันทรเจ็ด)

๓๕) นางสาวปรางค์ทิพย์...

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการการแพทย์

ผู้อำนวยการกองวิจัยและพัฒนายุทธศาสตร์

สำนักงานคณะกรรมการอาหารและยา

- ๒ -

๓๕) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๔
๓๖) นางสาวเดือนใจ หางกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๐
๓๗) นางสาวจิราพร ศิริเวช	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๒
๓๘) นายวรกร ผู้รักษ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๓
๓๙) นายทง วิริยะสทกิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๔
๔๐) นายธนิต เจนจบ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๕
๔๑) นายณิศร จำเพชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๖
๔๒) นายอรรคพล นิยมวิทยาพันธ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๗
๔๓) นายภูวิช พรหมสะอาด	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๘
๔๔) นายธนาเดช โภคาพิพัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๙
๔๕) นายชวฤทธิ์ วงษ์จันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๐
๔๖) นายอาทิตย์ ศรีเสน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๑
๔๗) นายเจตดินทร์ คงศักดิ์ไทย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๒
๔๘) นายจรัส บุญยิ่ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๕
๔๙) นายธนาณัติ เอนก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๖
๕๐) นายอภิวัฒน์ ทุมพู	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๗
๕๑) นางสาวสุภาขวัญ มาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๘
๕๒) นางสาวหัตถพร ชวาลสมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๐
๕๓) นางสาวธิดิมา บุญเที่ยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๑
๕๔) นางสาวกนกกร เข้มเพ็ชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๒
๕๕) นางสาวพัชรียา หงษ์สมิตี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๓
๕๖) นางสาวภาณิดา สุรวงศ์ตระกูล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๔
๕๗) นางสาวภาณุมาศ นามวัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๕
๕๘) นางสาวอุไรรัตน์ หึงสร้างแป้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๖
๕๙) นายธีรวัฒน์ ปวงสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๗
๖๐) นายอิทธิพล ยะโส	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๘
๖๑) นายประจักษ์ วรรณชูชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๙
๖๒) นายชยธร พวงทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๐
๖๓) นางสาวกนกวรรณ จันทบาล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๑
๖๔) นางสาวเกษร หลักบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๒
๖๕) นายสิทธิโชค ธงเงิน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๓
๖๖) นางศิวาวรรณ ใจบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๕
๖๗) นางสาวพรรณธิดา พุ่มคง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๘
๖๘) นางสาวศรณีย์ ยิ่งดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๙
๖๙) นายเนกัทธ ศรีวิริยะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๐
๗๐) นายสุวิชา ทองอ่อน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๑
๗๑) นายวิญญู บุญตะนัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๓

(นายศิระ จันทรเจ็ด)

๗๒) นายสมบูรณ์...

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการการแพทย์

ผู้อำนวยการกองวิจัยและพัฒนายุทธศาสตร์

สำนักงานคณะกรรมการอาหารและยา

๗๒) นายสมบุญ บุตรจันทร์  
๗๓) นายวิรัตน์ ไชยชนะรา  
๗๔) นายณณกรณ์ เพิ่มพูน  
๗๕) นายจิรณัฐ ขวาละออ  
๗๖) นายสมโภช วันสา  
๗๗) นายอัสริ นามบุรี  
๗๘) นายณัฐนันท์ ปานประเสริฐ  
๗๙) นายอัศวเรศ จอัสว  
๘๐) นายประเสริฐ สุระขันธ  
๘๑) นายบุญดล จันทร์นิยม  
๘๒) นายพิรพงษ์ ทองคุณปรีดา  
๘๓) นายณนฤพล ทองนุช  
๘๔) นายอนุวัฒน์ ม่วงแพ  
๘๕) นายเจตศราวุฒิ ปิตตะมะ  
๘๖) นายภฤชณะ สายวรรณ  
๘๗) นายพิชัย บุญยงค์  
๘๘) นายภาณุพงศ์ โอมวงศ์  
๘๙) นายสามารถ คุ่มปลี  
๙๐) นายสันติชัย โกศรีนาม  
๙๑) นายณัฐวิฑูรี ศรีประเสริฐ  
๙๒) นายชวลิตชัย นาคพนม  
๙๓) นายพงศธร ชัยทิพย์  
๙๔) ว่าที่ร้อยตรี ภาณุพงศ์ แสนศรี  
๙๕) นายสิทธิโชค ทาสีดา  
๙๖) นายธนากร อินสุตา  
๙๗) นางสาววรรณิษา ขาติวันชัย  
๙๘) นางสาวพิมพ์ตะวัน มีนากุล  
๙๙) นางสาวเพชรรัตน์ สิงห์สมบุญ  
๑๐๐) นางสาวชญาณีน พรหมจันทร์  
๑๐๑) นายกิตติ หวีราช  
๑๐๒) นายจักริน หมั่นวิชา  
๑๐๓) นายฉัตรชัย สุขเปี้ย  
๑๐๔) นายณรรณห์ ต๊ะทองคำ  
๑๐๕) นายศุภพล สมนอก  
๑๐๖) นายทักษิณันย์ อุบลศรี  
๑๐๗) นายธนศร นามะกณณา  
๑๐๘) นายธิดพงศ์ บัวแดง

ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๔  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๕  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๖  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๗  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๘  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๙  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๒๐  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๒๑  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๒๒  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๒๓  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๒๔  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๒๕  
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๓๖  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๓๗  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๓๘  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๓๙  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๐  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๑  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๒  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๓

(นายศิระ จันทร์เจิด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน  
ผู้อำนวยการกองวิจัยและพัฒนายุทธศาสตร์  
สำนักงานการวิจัยและพัฒนายุทธศาสตร์  
กองวิจัยและพัฒนายุทธศาสตร์ สำนักงานการวิจัยและพัฒนายุทธศาสตร์

๑๐๙) นายณนทชัย...

๑๐๙) นายณนทชัย อุปถัมภ์  
๑๑๐) นายณัฐพล คุณสุทธิ  
๑๑๑) นายณัฐวัฒน์ สาริน  
๑๑๒) นายปิยะนัฐ พลมะศรี  
๑๑๓) นายพงศ์สิริ โสมเขียว  
๑๑๔) นายพิรพัฒน์ กำคำ  
๑๑๕) นายภาณุพงศ์ มานิตย์  
๑๑๖) นายมงคล ผลาทิพย์  
๑๑๗) นายณัฐพัชร์ พูลศิริ  
๑๑๘) นายสิริภรณ์ ทองอิน  
๑๑๙) นายอนุชา หันสมัย  
๑๒๐) นายอดิศักดิ์ ฝัฒไผ  
๑๒๑) นายอนันตชัย วิสุม  
๑๒๒) นายณัฐดนัย เจือละออ  
๑๒๓) นายวรวิธ คีร์นิก  
๑๒๔) นายแสงตะวัน นตะสัด  
๑๒๕) นายยุทธพงศ์ รัตนะ  
๑๒๖) นายชัยวัฒน์ ไชยชนะ  
๑๒๗) นายวิศรุต ศรีธรรมมา  
๑๒๘) นายณนทกร เลือกผ่อง  
๑๒๙) นายทักษิณ สุทธะ  
๑๓๐) นางสาวณัฐภรณ์ รักทะเล  
๑๓๑) นางสาวประภาภรณ์ บุตรพรม  
๑๓๒) นางสาวนิลาวัลย์ นามพรม  
๑๓๓) นางสาวพัชรินทร์ แสนสร้อย  
๑๓๔) นายไพโรจน์ เปี่ยมพิมาย  
๑๓๕) นางสาวสุภาภาศ ทองมาก  
๑๓๖) นางสาวลลิตา จิตรสว่าง  
๑๓๗) นางสาวไมพร เลิกภูเขียว  
๑๓๘) นางสาวกฤติมาพร คำมีแก่น  
๑๓๙) นางสาวสกลรัตน์ ภาณุภูมิ  
๑๔๐) นางสาวกาญจนา คงคุณ  
๑๔๑) นางสาวไพรินทร์ ศรีวิฑู  
๑๔๒) นางสาวทิพนตร คุยปัญญา  
๑๔๓) นางสาวสาธิตา ปานทอง  
๑๔๔) นางสาวอริสา ทองนวล  
๑๔๕) นางสาวอริสา คำคำ

ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๔  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๕  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๖  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๗  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๘  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๙  
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๕๒  
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๕๔  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๕๕  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๕๖  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๕๗  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๕๘  
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๖๕  
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๖๗  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๖๘  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๖๙  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๐  
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๒  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๓  
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๔

(นายศิระ จันทร์เจิด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน  
ผู้อำนวยการกองวิจัยและพัฒนายุทธศาสตร์  
กองวิจัยและพัฒนายุทธศาสตร์ สำนักงานการวิจัยและพัฒนายุทธศาสตร์

๑๔๖) นางสาวชุตานภรณ์...

๑๔๖) นางสาวชุตานันท์ สุนทรสนาน	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๓๕
๑๔๗) นางสาวสุภารัตน์ นนทประสาธ	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๓๖
๑๔๘) นางสาวรัชฎีกร เนียมกลาง	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๓๗
๑๔๙) นางสาวกัญญารัตน์ ศรีนิลทา	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๓๘
๑๕๐) นางสาวอัญชลี คำจันทร์	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๓๙
๑๕๑) นายบุญฤทธิ์ เอี่ยมเทศ	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๐
๑๕๒) นายศิริวัฒน์ พานิชย์	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๑
๑๕๓) นางสาวศุภรดา ปันมยุรา	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๒
๑๕๔) นางสาวพาดิ คุณนาม	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๓
๑๕๕) นางสาวจิราเจต พองดา	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๔
๑๕๖) นางสาวกนกภรณ์ อูระ	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๕
๑๕๗) นางสาวอารยา มีชัย	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๖
๑๕๘) นางสาวจิตสุภา ประเทืองสุข	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๗
๑๕๙) นางสาวอริสา วิริยขันธิธรรม	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๘
๑๖๐) นางสาววิชชุดา นาคผ่อง	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๔๙
๑๖๑) นางสาวพนิดา ยอดอินทร์	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๕๐
๑๖๒) นางสาวนันทิยา จันทะลุน	ทะเบียนเลขที่ ๖-๒๐๔-จ-๙๒๕๑



(นายศิระ จันทะเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการเกษตร  
ผู้อำนวยการกองวิจัยและเคอโนกับมลพิษโรงงาน  
ปฏิบัติการงานหนักขึ้นทะเบียนโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับข้ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ๖-๒๐๔

ที่อก ๐๓๑๐(๑)/ ๑๐๖๕

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

แนบรายชื่อ จำนวน 59 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
5	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
6	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
7	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
8	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
9	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
10	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method <sup>(4)</sup> 2) 5-Day BOD Test, Membrane Electrode Method <sup>(4)</sup>
12	Carbaryl	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
13	Carbofuran	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
14	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
15	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method <sup>(4)</sup> 2) Closed Reflux, Titrmetric Method <sup>(4)</sup>
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
17	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Spectrometric Method <sup>(4)</sup>
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method



(นางจิราญจน์ ฉัตรสกุลวิไล)

19 Copper...

ผู้อำนวยการศูนย์มาตรฐานวิชาการวิเคราะห์มลพิษ  
และทะเบียนห้องปฏิบัติการ

วิมล  
(นางริกาญจน์ นัครสกุลวิไล)  
ผู้อำนวยการกลุ่มบริหารวิชาการ/วิเคราะห์ผลสอบนักเรียน  
โรงเรียนบ้านหนองบัว

44 Methomyl...

น้ำใต้ดิน จำนวน 126 รายการ

วิฑูรย์  
(นางวิภาณูจน์ ฉัตรสุกขวิไล)  
ผู้อำนวยการกลุ่มมาตรฐานบริการวิเคราะห์ทดสอบแบบพิเศษ  
กระทรวงมหาดไทย

3 Aldrin...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
5	Antimony	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
8	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
15	Benzo[g,h,i]perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

วิภาดา

18 Bis(2-ethylhexyl)phthalate...

(นางริกาญจน์ ฉัตรสกุลวิไล)  
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
กรมควบคุมมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
22	Butyl Benzyl Phthalate	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
33	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>

วิภาดา

34 Chromium (III)...

(นางริกาญจน์ ฉัตรสกุลวิไล)  
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
กรมควบคุมมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation <sup>(4)</sup>
35	Chromium (VI)	Colorimetric Method <sup>(4)</sup>
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
37	Cyanide	Distillation, Colorimetric Method <sup>(4)</sup>
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

วิมล

51 cis-1,2-Dichloroethylene...

(นางวิภาณูจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
กรมควบคุมมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
63	Di-n-Octyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

วิมล

68 Fluorene...

(นางวิภาณูจน์ ฉัตรสกุลวิไล)

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กรมควบคุมมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
74	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
75	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
76	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
81	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
82	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
83	Mercury	1) Cold Vapor Atomic Absorption Spectrometric Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>

วิธีวิเคราะห์

84 Methanol...

(นางริกาญจน์ อัครสกุลวิไล)

ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ห้องทดสอบมลพิษ  
กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

วิธีวิเคราะห์

97 Pentachlorophenol...

(นางริกาญจน์ อัครสกุลวิไล)

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กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
98	pH	Electrometric Method <sup>(4)</sup>
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
100	Phenol	1) Distillation, Direct Photometric Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
102	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
103	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
109	TPH (C <sub>5</sub> -C <sub>8</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,24)</sup>
110	TPH (C <sub>8</sub> -C <sub>16</sub> )	Solvent Extraction, Gas Chromatographic Method <sup>(9,21)</sup>
111	TPH (C <sub>16</sub> -C <sub>35</sub> )	Solvent Extraction, Gas Chromatographic Method <sup>(9,21)</sup>
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

วิภากร

114 1,1,2-Trichloroethane...

(นางริกาณูจน์ ฉัตรสกุลวิไล)  
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และประเมินภัยพิบัติ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
120	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
121	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
122	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
123	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
124	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
126	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>

ตรวจสอบรายชื่อ (ปล่องระบาย) จำนวน 16 รายการ


ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>

วิภากร

3 Carbon Monoxide...

(นางริกาณูจน์ ฉัตรสกุลวิไล)  
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และประเมินภัยพิบัติ


ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Carbon Monoxide	1) Sampling Bag Non-Dispersive Infrared Method <sup>[5]</sup> 2) Non-Dispersive Infrared Method <sup>[5]</sup> 3) Instrumental Analyzer Method <sup>[5]</sup>
4	Chlorine	1) Absorption Sampling, Ion Chromatographic Method <sup>[5]</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>[5]</sup>
5	Copper	Isokinetic, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
6	Dioxins	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory (Dioxins/Furans Analysis Approved) <sup>[5]</sup>
7	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method <sup>[5]</sup> 2) Isokinetic Sampling, Ion Chromatographic Method <sup>[5]</sup>
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>[5]</sup>
9	Lead	Isokinetic, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
10	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[5]</sup> 2) Isokinetic, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
11	Opacity	Ringelmann's Method <sup>[2]</sup>
12	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method <sup>[5]</sup> 2) Chemiluminescence Method <sup>[5]</sup> 3) Instrumental Analyzer Method <sup>[5]</sup>
13	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup> 2) UV Fluorescence Method <sup>[5]</sup> 3) Instrumental Analyzer Method <sup>[5]</sup>
14	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup>
15	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method <sup>[5]</sup>
16	Xylene	Adsorption Sampling, Gas Chromatographic Method <sup>[5]</sup>

  
 (นางริกาญจน์ จิตตรกุลไธ)  
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 กรมควบคุมมลพิษ

สิ่งปฏิกูล...


สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,25]</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,22]</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>[22,31]</sup>
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1,6,16]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[7,16]</sup>
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1,6,16]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[7,16]</sup>
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1,6,16]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[7,16]</sup>
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[1,6,15]</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[1,6,16]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[7,16]</sup>

  
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 กรมควบคุมมลพิษ


6 Cadmium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,19,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1,6,15,17)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1,6,16,17)</sup> 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,15,17)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,16,17)</sup>
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method <sup>(1,6,17)</sup> 2) Alkaline Digestion, Colorimetric Method <sup>(8,17)</sup>

  
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 กรมควบคุมมลพิษ

11 Cobalt...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup>

  
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 ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบ  
 กรมควบคุมมลพิษ

2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1,6,18)</sup>

วิมล

2) Waste Extraction...

(นางริกาญจน์ อัครสกุลวิไล)

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(1,6,19)</sup> 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(1,6,20)</sup> 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(18)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(19)</sup> 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(20)</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>


วิมล

27 Polychlorinated...

(นางริกาญจน์ อัครสกุลวิไล)


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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1,9,23)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>

  
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28 Pentachlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
29	pH	Electrometric Method <sup>(29,30)</sup>
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup>
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,16)</sup>
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup>

  
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4) Digestion...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup> 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(14,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>

ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
4	Anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
5	Antimony	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
8	Barium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>

วิกรม  
(นางริภาณูจน์ ฉัตรสกุลวิไล)  
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9 Benz(a)anthracene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Benz(a)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
11	Benzo(b)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
12	Benzo(k)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
13	Benzoic acid	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
14	Benzo(a)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
15	Benzo(g,h,i)perylene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
17	Bis(2-chloroethyl)ether	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
18	Bis(2-ethylhexyl)phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
21	Butanol	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(12,24)</sup>
22	Butyl Benzyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
24	Carbazole	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>

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26 Carbon tetrachloride...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
28	p-Chloroaniline	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
32	2-Chlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
33	Chromium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,15,17)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7,8,16,17)</sup>
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method <sup>(8,17)</sup>
36	Chrysene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
37	Cyanide	Extraction, Distillation, Colorimetric Method <sup>(26,27,28)</sup>
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
39	DDD	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>

40 DDE...


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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	DDE	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
41	DDT	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
42	Dibenz(a,h)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
43	Di-n-Butyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
47	3,3-Dichlorobenzidine	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
53	2,4-Dichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>

57 Dieldrin...


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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
58	Diethyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
59	2,4-Dimethylphenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
60	2,4-Dinitrophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
61	2,4-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
62	2,6-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
63	Di-n-Octyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
67	Fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
68	Fluorene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
70	Heptachlor Epoxide	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>

  
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71 Hexachlorobenzene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
74	α-HCH	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
75	β-HCH	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
76	γ-HCH	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
77	Hexachlorocyclopentadiene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
78	Hexachloroethane	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
79	Indeno(1,2,3-cd)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
80	Isophorone	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
81	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
82	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(18)</sup>

  
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2) Thermal...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry <sup>(19)</sup> 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(20)</sup> Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(12,24)</sup>
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
88	2-methylphenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
89	2-Methylnaphthalene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
91	Naphthalene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
93	Nitrobenzene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
94	N-Nitrosodiphenylamine	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
95	N-Nitrosodi-n-propylamine	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(23,32)</sup>

อิกพ  
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- Aroclor 1242...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	- Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3',3',4'-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>

อิกพ  
(นางวิภาญจน์ ฉัตรสกุลวิไล)  
ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ภาคกลางมลพิษ  
และประเมินผลปฏิบัติการ

101 Selenium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
102	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
108	TPH (C <sub>5</sub> -C <sub>8</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
109	TPH (C <sub>8</sub> - C <sub>16</sub> )	1) Solvent Extraction, Gas Chromatographic Method <sup>(11,21)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(21,31)</sup>
110	TPH (C <sub>16</sub> - C <sub>35</sub> )	1) Solvent Extraction, Gas Chromatographic Method <sup>(11,21)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(21,31)</sup>
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>

วิมล  
(นางวิภาญจน์ ฉัตรสกุลวิไล)  
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

116 2,4,6-Trichlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
116	2,4,6-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(25,31)</sup>
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(14,24)</sup>
125	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(7,16)</sup>

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วิมล  
(นางวิภาญจน์ ฉัตรสกุลวิไล)  
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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
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(นางริกาณัน จัตรสกุลวิไล)  
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

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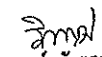
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ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ



ที่ อก ๐๓๑๐(๑)/ ๕๓๗ ๕

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐ ๙ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๔ กุมภาพันธ์ ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ  
วิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ  
เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๙ ราย

- |                                 |                            |
|---------------------------------|----------------------------|
| ๑) นายนคร สุขเจริญ              | ทะเบียนเลขที่ ๖-๒๐๔-จ-๖๑๒๒ |
| ๒) นายบัญชา นามเขตต์            | ทะเบียนเลขที่ ๖-๒๐๔-จ-๖๑๒๓ |
| ๓) นายอรรถพล นิยมวิทยาพันธ์     | ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๐๘๗ |
| ๔) นางสาวพัชรียา หงษ์สมดี       | ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๑๐๓ |
| ๕) นางสาวภาวนิดา สุรวงศ์ตระกูล  | ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๑๐๔ |
| ๖) นางสาวศรวิทย์ บึงดี          | ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๐๔ |
| ๗) นายสมโภช วันสา               | ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๔ |
| ๘) นายณัฐนันท์ ปานประเสริฐ      | ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๘๑๔ |
| ๙) ว่าที่ร้อยตรีภาณุพงศ์ แสนศรี | ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๘๓๖ |
| ๑๐) นายมนันท์ ทูลศิริ           | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๐๒ |
| ๑๑) นายณัฐดนัย เจือละออง        | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๐๗ |
| ๑๒) นางสาวกาญจนา คงคุณ          | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๒๔ |
| ๑๓) นางสาวรัชนิกร เนียมกลาง     | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๓๗ |
| ๑๔) นางสาวกัญญารัตน์ ศรีนิลหา   | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๓๘ |
| ๑๕) นายศิริวัฒน์ พานิชย์        | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๔๑ |
| ๑๖) นางสาวกนกภรณ์ อูระ          | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๔๕ |
| ๑๗) นางสาวจิตสุภา ประเทืองสุข   | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๔๗ |
| ๑๘) นางสาวอริสา วิริยะนิตธรรม   | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๔๘ |
| ๑๙) นางสาวพนิดา ยอดอินทร์       | ทะเบียนเลขที่ ๖-๒๐๔-จ-๘๖๕๐ |

๒. ให้เพิ่มเจ้าหน้าที่...

-๒-

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

- |                               |                            |
|-------------------------------|----------------------------|
| ๑) นายภาณุวัฒน์ กิตติคุณนิษฐ์ | ทะเบียนเลขที่ ๖-๒๐๔-จ-๐๐๐๑ |
| ๒) นายภัทรพล สว่างใจธรรม      | ทะเบียนเลขที่ ๖-๒๐๔-จ-๐๐๐๒ |
| ๓) นายณารัตน์ เทือกชัยคำ      | ทะเบียนเลขที่ ๖-๒๐๔-จ-๐๐๐๓ |
| ๔) นายศิริโชค พงษ์ประสม       | ทะเบียนเลขที่ ๖-๒๐๔-จ-๐๐๐๔ |
| ๕) นายณัฐวุฒิ ดังแพง          | ทะเบียนเลขที่ ๖-๒๐๔-จ-๐๐๐๕ |

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
ที่ อก ๐๓๑๐(๑)/๑๐๖๔ ลงวันที่ ๒๘ มกราคม ๒๕๖๕ คือในวันที่ ๒ กันยายน ๒๕๖๖ ทั้งนี้ สามารถยื่นคำขอ  
ผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code หายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางจิราภรณ์ จิตสกุลวิไล)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเลือกกันมลพิษโรงงาน

ปฏิบัติการการแทนอธิบดีกรมโรงงานอุตสาหกรรม

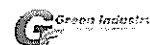
กองวิจัยและเลือกกันมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๔

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๔๔

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



กรมโรงงานอุตสาหกรรม กรมควบคุมมลพิษ กองวิจัยและเลือกกันมลพิษโรงงาน



ที่ อก ๐๓๑๐(๑)/ ๖ ๑๒ ๕



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๓ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบลอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขณิคมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๐ มีนาคม ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบลอราทอรี กรุ๊ป (ประเทศไทย) จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๕ สถานที่ตั้งเลขที่ ๑๐๕ ขอยพัฒนาการ ๔๐  
ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการ  
วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เปลี่ยนแปลงชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการ  
วิเคราะห์ จากเดิม นางสาวสาริณี มงคลจิรฤติ ทะเบียนเลขที่ ว-๒๐๕-จ-๔๗๑๙ เป็น นางสาวธัญญธร มงคลจิรฤติ  
ทะเบียนเลขที่ ว-๒๐๕-จ-๔๗๑๙

ทั้งนี้ หากท่านมีความประสงค์จะยื่นคำขอใดๆ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์  
ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ห้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม คำรพงษ์)  
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน  
ปฏิบัติการและสนับสนุนกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๕๔

ไปรษณีย์อิเล็กทรอนิกส์ sarabon@diw.mail.go.th



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์



กรมโรงงานอุตสาหกรรม กระทรวงอุตสาหกรรม ถนนพระรามที่ ๖ แขวงทุ่งพญาไท เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐





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