

# ภาคผนวก ง

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ใบรับรองการสอบเทียบเครื่องมือ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ผลิต

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Sulfur Dioxide	Console Control Unit	RYG-F50315	12-Jul-22	12-Jan-23	6
Stack	Sulfur Dioxide	Dry Gas	RYG-F50317	12-Jul-22	12-Jan-23	6
Stack	Total Suspended Particulate	Console Control Unit	RYG-F50315	12-Jul-22	12-Jan-23	6
Stack	Total Suspended Particulate	Digital Balance	RYG-F50003	23-Mar-22	23-Mar-23	12
Stack	Oxides of Nitrogen	Console Control Unit	RYG-F50315	12-Jul-22	12-Jan-23	6
Stack	Oxides of Nitrogen	Vacuum Gauge	RYG-F50333	6-Oct-21	6-Apr-23	18
Stack	Oxides of Nitrogen	PHOTOPHOTOMETER	RYG-F50037	21-Sep-22	21-Mar-24	18
Stack (CEM)	CEMPS 11 Test Audit for K factor	CEM Opacity Data	-	-	-	-
Stack	Total Suspended Particulate	Console Control Unit	BKK-F50347	12-Jul-22	12-Jan-23	6
Stack	Total Suspended Particulate	Digital Balance	BKK-F50309	14-Dec-21	14-Dec-22	12
Stack (CEM)	Oxides of Nitrogen	Analyzer - System Calibra	-	-	-	-
Stack (CEM)	Oxygen	Analyzer - System Calibra	-	-	-	-
Stack (CEM)	Fluorene	Analyzer - System Calibra	-	-	-	-
Stack (CEM)	Temperature	Analyzer - System Calibra	-	-	-	-
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	RYG-F50438	1-Jul-22	1-Jan-23	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	RYG-F50251	1-Jul-22	1-Jan-23	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	RYG-F50534	1-Jul-22	1-Jan-23	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	RYG-F50436	1-Jul-22	1-Jan-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG-F50535	1-Jul-22	1-Jan-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG-F50252	1-Jul-22	1-Jan-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG-F50439	1-Jul-22	1-Jan-23	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG-F50457	1-Jul-22	1-Jan-23	6
Ambient	Particulate Matter (PM <sub>10</sub> )	High Volume	RYG-F50400	-	-	On site Calibration
Ambient	Particulate Matter (PM <sub>10</sub> )	High Volume	RYG-F50188	-	-	On site Calibration
Ambient	Particulate Matter (PM <sub>10</sub> )	High Volume	RYG-F50189	-	-	On site Calibration
Ambient	Particulate Matter (PM <sub>10</sub> )	High Volume	RYG-F50191	-	-	On site Calibration
Ambient	Particulate Matter (PM <sub>10</sub> )	Digital Balance	BKK-F50001	23-Mar-22	23-Mar-23	12
Ambient	Total Suspended Particulate	High Volume	RYG-F50181	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG-F50335	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG-F50173	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG-F50180	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG-F50001	23-Mar-22	23-Mar-23	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direc	BKK-F50141	13-Sep-22	13-Sep-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direc	RYG-F50081	3-Jul-21	3-Jan-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direc	RYG-F50414	29-Jul-21	27-Jan-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direc	BKK-F50145	3-May-22	1-Nov-23	18
Noise	Leq 24 hrs	Sound Calibrator	RYG-F50215	31-Aug-22	31-Aug-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG-F50387	18-Oct-22	18-Oct-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG-F50388	16-Aug-22	16-Aug-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG-F50031	20-Jun-22	20-Jun-23	12
Noise	Leq 8 hrs	Sound Calibrator	RYG-F50215	26-Apr-22	26-Apr-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG-F50027	10-Jan-22	10-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG-F50304	11-Jul-22	11-Jul-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG-F50026	21-Jan-22	21-Jan-23	12
Workplace	Sulfur Dioxide as SO <sub>2</sub>	Field Rotameter	RYG-F50198	1-Oct-22	1-Jan-23	3
Workplace	Chlorine as HClO <sub>2</sub>	Field Rotameter	RYG-F50198	1-Oct-22	1-Jan-23	3
Workplace	Ethanolamine	Field Rotameter	RYG-F50199	1-Oct-22	1-Jan-23	3
Workplace	Ethanol	Field Rotameter	RYG-F50199	1-Oct-22	1-Jan-23	3
Workplace	Ethanol	GC-FID	BKK-F50153	27-Jan-22	27-Jul-23	18
Workplace	Sulfuric acid	Field Rotameter	RYG-F50198	1-Oct-22	1-Jan-23	3
Workplace	Sulfuric acid	Ion Chromatography	BKK-F50067	12-Jan-22	12-Jan-23	12
Workplace	Total Dust	Field Rotameter	RYG-F50198	1-Oct-22	1-Jan-23	3
Workplace	Total Dust	Digital Balance	RYG-F50008	23-Mar-22	23-Mar-23	12
Workplace	Respirable Dust	Field Rotameter	RYG-F50198	1-Oct-22	1-Jan-23	3
Workplace	Respirable Dust	Digital Balance	RYG-F50004	23-Mar-22	23-Mar-23	12
Workplace	Hydrogen Chloride	Field Rotameter	BKK-F51042	1-Oct-22	1-Jan-23	3

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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Hydrogen Chloride	Ion Chromatography	BKK-F50069	12-Jan-22	12-Jan-23	12
Workplace	Isopropyl Alcohol	Field Rotameter	RYG-F50199	1-Oct-22	1-Jan-23	3
Workplace	Isopropyl Alcohol	GC-FID	BKK-F50125	21-Oct-21	21-Apr-23	18

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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Zinc Chloride	Field Rotameter	RYG-F50198	1-Oct-22	1-Jan-23	3
Workplace	Zinc Chloride	KCP-OES	BKK-F50037	13-Sep-21	12-Mar-23	18
Workplace	Potassium Chromate	Field Rotameter	RYG-F50198	1-Oct-22	1-Jan-23	3
Workplace	Potassium Chromate	KCP-OES	BKK-F50037	13-Sep-21	12-Mar-23	18
Workplace	Sodium Hydroxide (Na2S2O4)	Field Rotameter	RYG-F50198	1-Oct-22	1-Jan-23	3
Workplace	Sodium Hydroxide (Na2S2O4)	KCP-OES	BKK-F50037	13-Sep-21	12-Mar-23	18
Workplace	Phosphoric Acid	Field Rotameter	BKK-F51042	1-Oct-22	1-Jan-23	3
Workplace	Phosphoric Acid	Ion Chromatography	BKK-F50069	12-Jan-22	12-Jan-23	12
Workplace	Sulfuric Acid	Field Rotameter	BKK-F51042	1-Oct-22	1-Jan-23	3
Workplace	Sulfuric Acid	Ion Chromatography	BKK-F50069	12-Jan-22	12-Jan-23	12
Workplace	Total Hydrocarbon as Methane	Total Hydrocarbon Analyz	RYG-F50038	14-Jan-22	14-Jan-23	12
Indoor Air	Air movement	INDOOR AIR QUALITY ME	BKK-F50333	3-Aug-21	1-Feb-23	18
Indoor Air	Flow rate	INDOOR AIR QUALITY ME	BKK-F50333	3-Aug-21	1-Feb-23	18
Illuminance	Illuminance	Lux Meter	RYG-F50234	2-Sep-22	2-Sep-23	12
Rayong Lab	BOD	DO meter with Sensor	RYG-F50032	14-Feb-22	15-Aug-23	18
Rayong Lab	BOD	Incubator	RYG-F50154	22-Apr-22	21-Oct-23	18
Rayong Lab	COD	Spectrophotometer	RYG-F50037	27-Sep-22	27-Mar-24	18
Rayong Lab	pH at 25 °C	pH meter	RYG-F50183	17-Mar-22	17-Mar-23	12
Rayong Lab	Oil & Grease	Electronic Balance	RYG-F50002	23-Mar-22	23-Mar-23	12
Rayong Lab	Oil & Grease	Hot Air Oven	RYG-F50009	20-Oct-22	20-Apr-24	18
Rayong Lab	Oil & Grease	Water Bath	RYG-F50061	20-Oct-22	20-Apr-24	18
Rayong Lab	Total Dissolved Solids 180%	Electronic Balance	RYG-F50002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Dissolved Solids 180%	Hot Air Oven	RYG-F50010	20-Oct-22	20-Apr-24	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG-F50002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Suspended Solids	Hot Air Oven	RYG-F50010	20-Oct-22	20-Apr-24	18
Rayong Lab	Temperature	pH Meter	RYG-F50420	14-Mar-22	14-Mar-23	12

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CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration No. C-120722-RYG-F50315  
Dry Gas Meter No. RYG-F50315  
Console Serial No. 1706091  
Console Model No. XC-572-V

Barometric Pressure (mm.Hg) 12 Jul 22  
Relative Humidity (%) 12 Jan 23  
Temperature (°C)

Reference Dry Gas Meter No. Serial No. Model No. Correction Factor (Vr)  
Next Calibration Date

ΔH (mm.H <sub>2</sub> O)	θ Minutes	Reference Dry Gas Meter Calibration						Console Control - Drygas Meter			
		Vr (liters)		Tr (°C)		Vm (liters)		Tt (°C)			
		Final	Initial	Total		Final	Initial	Total			
15	12.30	150.00	0.00	150.00	27.0	144403.0	144058.0	145.00	27.0	2	
25	9.45	150.00	0.00	150.00	30.0	144395.0	144249.0	146.00	28.0	2	
50	6.73	150.00	0.00	150.00	31.0	144742.0	144598.0	146.00	28.0	2	
100	4.70	150.00	0.00	150.00	31.0	144505.0	144305.0	146.00	30.0	2	
150	3.81	150.00	0.00	150.00	33.0	144599.0	144504.0	146.00	30.0	2	

Y: Rate of reading of reference to dry gas meter. tolerance for individual values = 0.02 from average.  
ΔH: Orifice pressure differential that equates to 21.24 in. of air @ 25 °C and 760 mm of mercury. mmH<sub>2</sub>O: tolerance for individual values  
Procedure: 40 CFR 60 APP A METH. REC 5.3 & 7

Calibrated by: (Mr. N)  
Approved by: (Mr. N)  
Field Scientist (I)



### DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date	12-Jul-22	Ambient Temperature (°C)	30
Calibration sheet No.	C-120722-RYG_FS0316	Relative Humidity (%)	70
Digital Temperature ID	RYG_FS0316	Reference Temperature ID	BKK_FS1144
Console Serial No.	1700091	Serial No.	201090005013
Console Model	XC-572-V	Model	Digicon-CC-VT-MS
		Next Calibrate	31 Jan 23

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	27	2	
	50	53	3	
	100	104	4	
	150	154	4	
	200	202	2	
	250	253	3	
	300	304	4	
	500	505	5	
	1000	1003	3	
	1200	1202	2	
Probe	100	104	4	
	125	129	4	
	150	154	4	
Oven	100	104	4	
	125	129	4	
	150	154	4	
Filter	100	104	4	
	125	129	4	
	150	154	4	
Exit	0	0	0	
	10	11	1	
	20	22	2	
Meter	0	0	0	
	25	27	2	
	50	52	2	
AUX	0	0	0	
	25	27	2	
	50	53	3	

Calibrated by

(Mr Innakom Kulchar)  
Field Scientist (1)

Approved by

(Mr Nathapol Jengwarewong)  
Field Specialist(1)

Form 281-040 (14/03/102)



### PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date	12 Jul 22	Nozzle Set ID	RYG_FS0319
Calibration Sheet No.	C-120722-RYG_FS0319	Vernier Caliper ID	BKK_FS0626

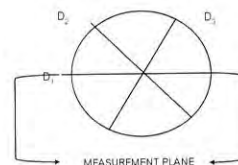
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo ΔD	(D <sub>1</sub> + D <sub>2</sub> + D <sub>3</sub> ) / 3 D <sub>avg</sub>
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>		
1	0.300	0.300	0.300	0.000	0.300
2	0.470	0.465	0.465	0.005	0.467
3	0.600	0.600	0.600	0.006	0.600
4	0.770	0.760	0.755	0.015	0.762
5	0.920	0.930	0.930	0.010	0.927
6	1.080	1.080	1.085	0.005	1.082
7	1.240	1.220	1.235	0.020	1.232
8	1.550	1.570	1.540	0.030	1.553

Where:

D<sub>1</sub>, D<sub>2</sub>, D<sub>3</sub> = Three different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm

D<sub>avg</sub> = (D<sub>1</sub> + D<sub>2</sub> + D<sub>3</sub>) / 3



Calibrated by

(Innakom Kulchar)  
Field Scientist (1)

Approved by

(Mr Nathapol Jengwarewong)  
Field Specialist(1)

Form No. 02-281-029 (1.8/01/03)



### Pitot Tube Calibration Data

Pitot Tube Identification Number : RYG\_FS0320 Calibration Date : 12 Jul 22  
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK\_FS0441  
Calibration Sheet No. : C-120722-RYG\_FS0320 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm H <sub>2</sub> O)	Type s pitot tube (ΔP, mm H <sub>2</sub> O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			C <sub>p</sub>	0.842	0.842

$$C_p(s) = C_p \cdot \sqrt{\frac{\Delta P(s)}{\Delta P}}$$

$$\bar{C}_{p(A)} - \bar{C}_{p(B)} \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum [C_p(s) - C_p(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by

(Mr Innakom Kulchar)  
Field Scientist (1)

Approved by

(Mr Nathapol Jengwarewong)  
Field Specialist(1)

Form 281-040 (14/03/102)



### Pitot Tube Calibration Data

Pitot Tube Identification Number : RYG\_FS0321 Calibration Date : 12 Jul 22  
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK\_FS0441  
Calibration Sheet No. : C-120722-RYG\_FS0321 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm H <sub>2</sub> O)	Type s pitot tube (ΔP, mm H <sub>2</sub> O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			C <sub>p</sub>	0.842	0.842

$$C_p(s) = C_p \cdot \sqrt{\frac{\Delta P(s)}{\Delta P}}$$

$$\bar{C}_{p(A)} - \bar{C}_{p(B)} \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum [C_p(s) - C_p(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by

(Mr Innakom Kulchar)  
Field Scientist (1)

Approved by

(Mr Nathapol Jengwarewong)  
Field Specialist(1)

Form 281-040 (14/03/102)





### DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date : 12 Jul 22  
Next Calibration Date : 12 Jan 23

Barometric Pressure (mm.Hg) : 755  
Relative Humidity (%) : 70.0  
Temperature (°C) : 30.0

**Dry Gas Meter Data**  
Calibration sheet No. : C-120722-RYG\_F50317  
Dry Gas Meter No. : RYG\_F50317  
Console Serial No. : 1706003  
Model No. : XC-62-CV

**Reference Dry Gas Meter Data**  
Serial No. : A2003240  
Model No. : DGM-SK25RM-QS8  
Correction Factor (Yr) : 1.0160  
Next Calibration Date : 27 May 23

Reference Dry Gas Meter Calibration						Dry Gas Meter						Dry Gas Meter Correction	
Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg. Tm (°C)	Factor (Y)			
Final	Initial	Total		Final	Initial	Total							
30.00	0.00	30.00	28.0	29.99	0.00	29.99	28.0	27.0	27.5				
30.00	0.00	30.00	28.0	30.01	0.00	30.01	28.0	28.0	28.0				
60.00	0.00	60.00	28.0	60.20	0.00	60.20	29.0	29.0	29.0				
60.00	0.00	60.00	28.0	60.12	0.00	60.12	29.0	29.0	29.0				
90.00	0.00	90.00	28.0	89.97	0.00	89.97	30.0	30.0	30.0				
90.00	0.00	90.00	28.0	90.10	0.00	90.10	30.0	30.0	30.0				
Avg										1.0181			

Y = Ratio of reading of reference dry gas meter to dry gas meter, tolerance for individual  $\pm 0.02$  from average

Calibrate by :

Mr Tinnakorn Kulchat  
Field Scientist (I)

Approved by :

(Mr Nathapong Jengwarewong)  
Field Specialist (I)

Form No. 281-022-0106/01/1



### DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date	12 Jul 22	Ambient Temperature (°C)	30	
Calibration sheet No.	C-120722-RYG_FS0317	Relative Humidity (%)	70	
Digital Temperature ID	RYG_FS0317	Reference Temperature ID	BKK_FS1144	
Serial No.	1706003	Serial No.	201090000013	
Model	XC-62-CV	Model	Digicon-CC-VT-MS	
		Next Calibrate	31 Jan 23	
Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	25	0	
	50	50	0	
	100	100	0	
	150	151	1	
	200	201	1	
	250	251	1	
	300	301	1	
	500	501	1	
	1000	1002	2	
Probe	1200	1203	3	
	100	100	0	
	125	125	0	
Filter	150	151	1	
	100	100	0	
	125	125	0	
Exit	150	151	1	
	0	0	0	
	10	10	0	
Meter	20	20	0	
	0	0	0	
	25	25	0	
AUX	50	50	0	
	0	0	0	
	25	25	0	
	50	50	0	

Calibrated by :

(Mr Tinnakorn Kulchat)  
Field Scientist (I)

Approved by :

(Mr Nathapong Jengwarewong)  
Field Specialist (I)



### Rotameter Calibration Report

Calibration Date : 12 Jul 22  
Rotameter ID : RYG\_F50317  
Calibration Sheet No : C-120722-RYG\_F50317

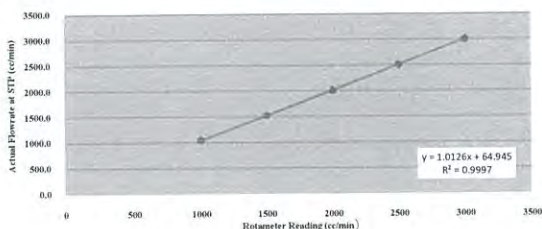
Relative Humidity (%) : 70.0  
Barometric Pressure (mmHg) : 755  
Temperature (°C) : 30.0

#### Primary Equipment Data

Brand : Bios  
Model : Defender 520 M  
Serial No. : L29958  
ID : RYG\_F50209

#### Calibration Data

Rotameter Reading(cc/min)	Actual Flowrate (cc/min)				Actual Flowrate at STP (cc/min)
	1	2	3	Avg.	
1000	1085.0	1073.0	1065.0	1074.3	1049.6
1500	1548.0	1566.0	1565.0	1559.7	1523.8
2000	2065.0	2054.0	2058.0	2059.0	2011.7
2500	2573.0	2569.0	2567.0	2569.7	2510.6
3000	3064.0	3089.0	3085.0	3079.3	3008.6



Calibrated by :

(Mr Tinnakorn Kulchat)  
Field Scientist (I)

Approved by :

(Mr Nathapong Jengwarewong)  
Field Specialist (I)



**PENTA**  
CALIBRATION

**PENTA CALIBRATION CO., LTD.**  
66/124 The Connect 33 Village Kanchanaphisek Road,  
Dokkai Praveh Bangkok 10250  
Tel : +66 (0) 2069-9773  
www.pentalab.com

### Certificate of Calibration

Represent to Certificate of Calibration : PTC/07/22099

Certificate No. : PTC/07/22099  
Equipment : Digital Balance  
Manufacturer : Sartorius  
Model : MSU2245-100-DU  
Type of Balance : Single interval

Page : 1 of 2  
Condition : Normal  
Serial No. : 31709552  
ID No. : RYG\_EN0003

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

Environment Condition : Temperature : 23.9 °C  $\pm 0.3$  °C  
Humidity : 58.1 %RH  $\pm 4.4$  %RH  
Air density : 1.17 kg/m<sup>3</sup>

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

The Method used : In house method, PTC-WI-07, base on Euramet cg. 18

Traceability : This certificate is traceable to the SI Units through Thai Calibration Service Co., Ltd.  
NSC-ONSC Accreditation No. Calibration 0189

Date Received : March 23, 2022

Calibration Date : March 23, 2022

Issued Date : March 25, 2022

Calibration By : Mr Rungrong Metakul

(Mr Kriangsak Kalasin)  
Reviewed by

Approved By : (Mr Kestisak Kercho)  
Laboratory Manager

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard 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 the Expression of Uncertainty in Measurement (GUM). The effect that the results relate only to the items calibrated.

This calibration certificate shall not be reproduced except in full only, without written approval from Penta Calibration Co., Ltd.

PTC/07/22 31709552



Represent to Certificate of Calibration, PTC/07/22099

Certificate No.: PTC/07/22099

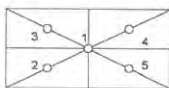
Page: 2 of 2

**Measurement Results:**

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Eccentricity test 100 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0001	-0.0001	0.0001
Maximum deviation: 0.0001				

Repeatability Test: Weight to be 1/2 ≤ L<sub>1</sub> ≤ Maximum capacity

Determination of the standard deviation of weighing balance: Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.000042
200	0.000071

Error of Indication: from nominal value, Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.00020	2.65
0.01	0.01000	0.0099	0.0001	0.00020	2.43
0.1	0.10000	0.1000	0.0000	0.00020	2.43
0.5	0.50000	0.5000	0.0000	0.00020	2.43
1	1.00000	1.0000	0.0000	0.00020	2.43
5	5.00001	5.0000	0.0000	0.00020	2.43
10	10.00000	10.0000	0.0000	0.00020	2.43
20	20.00003	20.0000	0.0000	0.00020	2.43
50	50.00004	50.0000	0.0000	0.00021	2.32
100	100.00004	99.9999	0.0001	0.00022	2.17
200	200.00011	200.0000	0.0001	0.00027	2.05

Note: Weight of adjust (g)

The End of Certificate

WPC-FMC-01-02 2 Feb 2020



**Certificate of Calibration**

Certificate No.: 21P3344  
Page: 1 of 2

Equipment: Vacuum Gauge

Manufacturer: QualityWell

Model: F221AVD

Serial No.: VG02

ID No.: RYG\_FS0333

Condition As-Received: Used Item

Received Date: 01 October 2021

Calibration Date: 06 October 2021

Reference: 2110-0060WSC

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1008 mbar

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

104 Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to In-house calibration procedure CP-P06, using "DKD-R 6-1: Calibration of Pressure Gauges, Edition 03/2014" as a guideline.

**Condition of this result of calibration**

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Pressure Gauge	15PSIXP2	158670	21P2929	03 Sep 2022

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

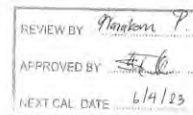
3. This result of calibration was made on requested at the point specified by customer.

4. Scale and conversion factor is 1 kPa = 0.2953 inHg

5. This instrument was used clean air as pressure media.

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

7. This Certification is traceable to the International System of Unit maintained at - National Institute of Metrology Thailand (NIMT)



Calibrated by: Nopparat Phongam  
Issue Date: 07 October 2021

Approved Signatory: Atapol P.  
[ ] Phalinee Prabpai  
[ ] Sura Suwanasri  
[x] Atapol Panurach

B 0270821



Cert No.: 21P3344  
Page: 2 of 2

Result of calibration: Without adjustment

Function: Vacuum Pressure Measurement

Range: 0 inHg to -30 inHg

Scale Interval: 0.5 inHg (The Fifth Estimate)

Increasing Pressure

Applied Pressure (inHg)	0.00	-4.97	-9.97	-14.97	-19.99	-26.02
UUC* Indication (inHg)	0.0	-5.0	-10.0	-15.0	-20.0	-26.0
Error (inHg)	0.00	-0.03	-0.03	-0.03	-0.01	0.02

Decreasing Pressure

Applied Pressure (inHg)	-26.00	-19.97	-14.95	-9.98	-4.97	0.00
UUC* Indication (inHg)	-26.0	-20.0	-15.0	-10.0	-5.0	0.0
Error (inHg)	0.00	-0.03	-0.05	-0.04	-0.03	0.00

The uncertainty of measurement was ± 0.12 inHg

\* UUC = Unit Under Calibration

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

-000-



**Certificate of Calibration**

Equipment: SPECTROPHOTOMETER

Model: DR6000

Serial No. (or ID.): 1627845 (RYG\_EN0037)

Manufacturer: HACH

Condition: In Condition

Certificate No.: C06220464

Issued Date: 27 September 2022

Job No.: KSPR2212224

Page: 1 of 3

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

616/10 Moo 5 T.Maenam Khu,

A.Pluakdaeng, Rayong 21140, Thailand.

REVIEW BY: N.Banyat

APPROVED BY: P.A.

NEXT CAL DATE: 27/11/24

Environment Condition: Temperature 23.1 °C ±

Humidity 65.4 %RH ±

3.2 %RH

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch) ( Wet Chemistry )

616/10 Moo 5 T.Maenam Khu,

A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Chattuphon Fothong

Calibration Date: 27 September 2022

The Method used: In house method, CAL-WI-24, base on ASTM E 275-06 and ASTM E 387-04

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

The standard for Wavelength Certificate No. 91418 and 91435  
The standard for Photometric Certificate No. 91441 and 101088  
The standard for Stray light Certificate No. 101041 and 101040  
The standard for Spectral resolution Certificate No. 101037

(Mr. Chattuphon Fothong)  
Person in charge

(Mr. Thalemgkiew Pongngam)  
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated in the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

DKSH Technology Limited  
2533 หมู่ 5 ตำบลบ้านใหม่ อำเภอเมือง จังหวัดภูเก็ต 83000  
2533 บ้านใหม่ Road, Bangnae, Phangnga, Bangkok 10250  
Phone: +66 2059 7500 Email: info@dksh.com Website: www.dksh.com/en/thailand

Delivering Growth - In Asia and Beyond.

CALFM-005-13: 20 Jul 2023

Atxapol P.

B 1075036



Calibration Results:  
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.61	418.4	0.21	0.14	
536.66	536.7	-0.04	0.14	
637.98	638.3	-0.32	0.14	
748.48	748.8	-0.32	0.14	
807.03	807.4	-0.37	0.13	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5605	0.563	-0.0025	0.0045
	0.7334	0.737	-0.0036	0.0045
	1.0534	1.057	-0.0036	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5503	0.553	-0.0027	0.0045
	0.7179	0.720	-0.0021	0.0045
	1.0312	1.034	-0.0028	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5024	0.506	-0.0036	0.0045
	0.6683	0.672	-0.0027	0.0045
	0.9604	0.964	-0.0036	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5168	0.519	-0.0022	0.0045
	0.6903	0.691	-0.0007	0.0045
	0.9904	0.992	-0.0016	0.0045
560 nm	0.0000	0.000	0.0000	0.0045
	0.5525	0.554	-0.0015	0.0045
	0.7175	0.718	-0.0005	0.0045
	1.0301	1.031	-0.0008	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5367	0.538	-0.0013	0.0045
	0.6847	0.685	-0.0003	0.0045
	0.9823	0.983	-0.0007	0.0045

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 หมู่ 9 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
2533 Sukhumvit Road, Bangkok, Phra Prathum, Bangkok 10110  
Phone: +66 2832 7000 Email: info.asia@dksh.com Website: www.dksh.com/thailand

Delivering Growth - In Asia and Beyond.

CALFM-C06-13: 20 Jul 2022

Calibration Results:  
Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7423	0.744	-0.0017	0.0083
257 nm	0.0000	0.000	0.0000	0.0080
	0.8609	0.861	-0.0001	0.0084
313 nm	0.0000	0.000	0.0000	0.0080
	0.2885	0.292	-0.0025	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.5381	0.538	0.0001	0.0080
Stray light *				
Standard: cut-off		UUC: Wavelength (nm)	UUC: Transmittance (5T)	Absorbance (A)
280.67 +/- 0.11 nm		280.7	2.1	1.878
391.94 +/- 0.11 nm		391.9	1.7	1.770
Spectral Resolution *				
Nominal Concentration 0.02 % w/v		Peak	Trough	Ratio
Standard Wavelength (nm)		268.80	266.63	1.39
UUC: Wavelength (nm)		268.2		
Std Absorbance (A)		0.4810	0.3176	
Absorbance (A)		0.373	0.268	

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

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 หมู่ 9 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
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CALFM-C06-13: 20 Jul 2022

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2212224

ชนิดเครื่องวัด: SPECTROPHOTOMETER

รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (รับ)		ตรวจสอบ (ส่ง)		หมายเหตุ
27 Sep 2022		27 Sep 2022		
ปกติ	ไม่ปกติ	รายการตรวจเช็ค		
		ปกติ	ไม่ปกติ	
General				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Spectrophotometer				
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่สำรอง (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	7. ควบคุมเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	856.1 nm 856.1 nm
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช่องรับหลายหัววัดแสง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
pH Meter and Conductivity Meter				
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันฝุ่น Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>
Turbidimeter				
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ผิดปกติ (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการสะท้อนแสงของเลนส์ (>= 2.5 ไม่นับ 3.0)	<input type="checkbox"/>	<input type="checkbox"/>
Automatic Dilutor				
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายนำและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>

เพิ่มข้อมูลแนบมา:

Mr. Chattaphon Folihong  
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
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Delivering Growth - In Asia and Beyond.

CAL-FM-R31-03: 20 Jul 2022

CEMs Opacity Data (mg/m<sup>3</sup> at Actual O<sub>2</sub>)

Client Name: Amata B.Grimm Power  
Plant Name: ABPR 3

Date: 21-Oct-22  
Location: HR8031

Run No.1		Run No.2		Run No.3		Run No.4		Run No.5	
Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )
10:30	1.60	11:25	1.91	12:20	1.75	13:15	1.70	14:10	1.49
10:31	1.59	11:26	1.91	12:21	1.60	13:16	1.66	14:11	1.38
10:32	1.57	11:27	1.88	12:22	1.56	13:17	1.73	14:12	1.38
10:33	1.58	11:28	1.76	12:23	1.73	13:18	1.67	14:13	1.40
10:34	1.63	11:29	1.76	12:24	1.73	13:19	1.70	14:14	1.30
10:35	1.61	11:30	1.81	12:25	1.77	13:20	1.74	14:15	1.32
10:36	1.69	11:31	1.59	12:26	1.62	13:21	1.71	14:16	1.42
10:37	1.64	11:32	1.69	12:27	1.57	13:22	1.64	14:17	1.45
10:38	1.58	11:33	1.82	12:28	1.68	13:23	1.56	14:18	1.40
10:39	1.64	11:34	1.81	12:29	1.66	13:24	1.64	14:19	1.44
10:40	1.69	11:35	1.79	12:30	1.65	13:25	1.62	14:20	1.52
10:41	1.53	11:36	1.82	12:31	1.59	13:26	1.62	14:21	1.28
10:42	1.62	11:37	1.87	12:32	1.68	13:27	1.72	14:22	1.29
10:43	1.57	11:38	1.84	12:33	1.58	13:28	1.66	14:23	1.35
10:44	1.60	11:39	1.83	12:34	1.66	13:29	1.79	14:24	1.36
10:45	1.57	11:40	1.86	12:35	1.83	13:30	1.81	14:25	1.38
10:46	1.61	11:41	1.87	12:36	1.86	13:31	1.78	14:26	1.38
10:47	1.66	11:42	1.88	12:37	1.83	13:32	1.72	14:27	1.35
10:48	1.78	11:43	1.95	12:38	1.79	13:33	1.73	14:28	1.27
10:49	1.78	11:44	1.91	12:39	1.81	13:34	1.65	14:29	1.37
10:50	1.76	11:45	1.96	12:40	1.83	13:35	1.77	14:30	1.35
10:51	1.79	11:46	2.01	12:41	1.87	13:36	1.94	14:31	1.30
10:52	1.77	11:47	1.96	12:42	1.86	13:37	1.88	14:32	1.34
10:53	1.70	11:48	1.91	12:43	1.72	13:38	1.97	14:33	1.30
10:54	1.65	11:49	2.09	12:44	1.72	13:39	1.99	14:34	1.34
10:55	1.72	11:50	1.91	12:45	1.65	13:40	1.95	14:35	1.45
10:56	1.60	11:51	2.04	12:46	1.61	13:41	1.98	14:36	1.59
10:57	1.50	11:52	2.02	12:47	1.61	13:42	1.94	14:37	1.68
10:58	1.44	11:53	2.02	12:48	1.55	13:43	1.90	14:38	1.65
10:59	1.50	11:54	1.96	12:49	1.48	13:44	1.88	14:39	1.82
11:00	1.70	11:55	1.89	12:50	1.46	13:45	1.86	14:40	1.78
11:01	1.64	11:56	1.84	12:51	1.54	13:46	1.83	14:41	1.88
11:02	1.79	11:57	1.81	12:52	1.55	13:47	1.86	14:42	1.87
11:03	1.73	11:58	1.67	12:53	1.55	13:48	1.53	14:43	1.83
11:04	1.73	11:59	1.70	12:54	1.70	13:49	1.57	14:44	1.83
11:05	1.68	12:00	1.65	12:55	1.55	13:50	1.53	14:45	1.85
11:06	1.64	12:01	1.59	12:56	1.69	13:51	1.55	14:46	1.80
11:07	1.64	12:02	1.61	12:57	1.73	13:52	1.53	14:47	1.80
11:08	1.57	12:03	1.57	12:58	1.78	13:53	1.51	14:48	1.80
11:09	1.56	12:04	1.58	12:59	1.80	13:54	1.59	14:49	1.66
11:10	1.60	12:05	1.71	13:00	1.89	13:55	1.65	14:50	1.67
11:11	1.62	12:06	1.68	13:01	1.82	13:56	1.59	14:51	1.61
11:12	1.65	12:07	1.75	13:02	1.81	13:57	1.62	14:52	1.64
11:13	1.78	12:08	1.77	13:03	1.81	13:58	1.69	14:53	1.63
11:14	1.75	12:09	1.69	13:04	1.81	13:59	1.68	14:54	1.67
11:15	1.68	12:10	1.76	13:05	1.73	14:00	1.60	14:55	1.61
11:16	1.63	12:11	1.69	13:06	1.68	14:01	1.66	14:56	1.58
11:17	1.78	12:12	1.61	13:07	1.67	14:02	1.71	14:57	1.65
11:18	1.77	12:13	1.58	13:08	1.78	14:03	1.73	14:58	1.61
Avg.	1.65	Avg.	1.81	Avg.	1.70	Avg.	1.72	Avg.	1.53



CEMs Opacity Data (mg/m<sup>3</sup> at Actual O<sub>2</sub>)Client Name **Amata B.Grimm Power**  
Plant Name **ABPR 3**Date **21-Oct-22**  
Location **HR8031**

Run No.6		Run No.7		Run No.8		Run No.9		Run No.10	
Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )
15:05	1.83	16:00	1.61	16:55	1.57	10:00	1.49	10:55	1.24
15:06	1.77	16:01	1.59	16:56	1.56	10:01	1.41	10:56	1.25
15:07	1.74	16:02	1.63	16:57	1.48	10:02	1.47	10:57	1.26
15:08	1.74	16:03	1.63	16:58	1.39	10:03	1.42	10:58	1.25
15:09	1.69	16:04	1.65	16:59	1.38	10:04	1.40	10:59	1.35
15:10	1.83	16:05	1.66	17:00	1.45	10:05	1.51	11:00	1.34
15:11	1.89	16:06	1.61	17:01	1.45	10:06	1.45	11:01	1.43
15:12	1.88	16:07	1.56	17:02	1.41	10:07	1.36	11:02	1.42
15:13	1.85	16:08	1.52	17:03	1.42	10:08	1.32	11:03	1.42
15:14	1.81	16:09	1.57	17:04	1.49	10:09	1.20	11:04	1.48
15:15	1.79	16:10	1.59	17:05	1.59	10:10	1.18	11:05	1.59
15:16	1.84	16:11	1.54	17:06	1.50	10:11	1.12	11:06	1.64
15:17	1.82	16:12	1.56	17:07	1.53	10:12	1.20	11:07	1.82
15:18	1.78	16:13	1.55	17:08	1.48	10:13	1.30	11:08	1.80
15:19	1.76	16:14	1.62	17:09	1.55	10:14	1.38	11:09	1.78
15:20	1.67	16:15	1.56	17:10	1.43	10:15	1.32	11:10	1.74
15:21	1.60	16:16	1.58	17:11	1.33	10:16	1.30	11:11	1.73
15:22	1.69	16:17	1.46	17:12	1.38	10:17	1.27	11:12	1.69
15:23	1.65	16:18	1.32	17:13	1.37	10:18	1.22	11:13	1.76
15:24	1.57	16:19	1.49	17:14	1.33	10:19	1.09	11:14	1.73
15:25	1.61	16:20	1.50	17:15	1.37	10:20	1.17	11:15	1.76
15:26	1.48	16:21	1.50	17:16	1.39	10:21	1.24	11:16	1.76
15:27	1.55	16:22	1.57	17:17	1.33	10:22	1.38	11:17	1.84
15:28	1.51	16:23	1.50	17:18	1.46	10:23	1.42	11:18	1.72
15:29	1.56	16:24	1.45	17:19	1.43	10:24	1.40	11:19	1.68
15:30	1.53	16:25	1.49	17:20	1.42	10:25	1.41	11:20	1.71
15:31	1.61	16:26	1.60	17:21	1.40	10:26	1.44	11:21	1.72
15:32	1.57	16:27	1.75	17:22	1.35	10:27	1.45	11:22	1.76
15:33	1.59	16:28	1.76	17:23	1.34	10:28	1.43	11:23	1.77
15:34	1.53	16:29	1.91	17:24	1.39	10:29	1.33	11:24	1.77
15:35	1.50	16:30	1.83	17:25	1.37	10:30	1.16	11:25	1.69
15:36	1.52	16:31	1.74	17:26	1.41	10:31	1.18	11:26	1.58
15:37	1.60	16:32	1.70	17:27	1.43	10:32	1.10	11:27	1.47
15:38	1.67	16:33	1.65	17:28	1.50	10:33	1.09	11:28	1.39
15:39	1.60	16:34	1.72	17:29	1.46	10:34	1.20	11:29	1.36
15:40	1.57	16:35	1.69	17:30	1.50	10:35	1.17	11:30	1.41
15:41	1.61	16:36	1.65	17:31	1.45	10:36	1.31	11:31	1.35
15:42	1.68	16:37	1.62	17:32	1.52	10:37	1.50	11:32	1.31
15:43	1.72	16:38	1.56	17:33	1.55	10:38	1.41	11:33	1.32
15:44	1.70	16:39	1.46	17:34	1.52	10:39	1.38	11:34	1.31
15:45	1.61	16:40	1.50	17:35	1.53	10:40	1.37	11:35	1.36
15:46	1.58	16:41	1.48	17:36	1.40	10:41	1.34	11:36	1.42
15:47	1.62	16:42	1.48	17:37	1.45	10:42	1.30	11:37	1.49
15:48	1.57	16:43	1.49	17:38	1.48	10:43	1.26	11:38	1.47
15:49	1.58	16:44	1.46	17:39	1.48	10:44	1.25	11:39	1.57
15:50	1.60	16:45	1.43	17:40	1.53	10:45	1.11	11:40	1.55
15:51	1.57	16:46	1.50	17:41	1.51	10:46	1.32	11:41	1.61
15:52	1.51	16:47	1.59	17:42	1.45	10:47	1.30	11:42	1.52
15:53	1.53	16:48	1.47	17:43	1.48	10:48	1.31	11:43	1.48
Avg.	1.65	Avg.	1.58	Avg.	1.45	Avg.	1.31	Avg.	1.55

CEMs Opacity Data (mg/m<sup>3</sup> at Actual O<sub>2</sub>)Client Name **Amata B.Grimm Power**  
Plant Name **ABPR 3**Date **24-Oct-22**  
Location **HR8031**

Run No.11		Run No.12		Run No.13		Run No.14		Run No.15	
Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )
11:55	1.58	12:45	1.13	13:40	1.23	14:35	1.03	15:30	1.07
11:56	1.54	12:46	1.34	13:41	1.24	14:36	0.98	15:31	1.08
11:57	1.43	12:47	1.27	13:42	1.17	14:37	0.87	15:32	1.12
11:58	1.46	12:48	1.26	13:43	1.19	14:38	0.73	15:33	1.16
11:59	1.33	12:49	1.34	13:44	1.17	14:39	0.74	15:34	1.09
12:00	1.30	12:50	1.45	13:45	1.14	14:40	0.64	15:35	1.17
12:01	1.26	12:51	1.53	13:46	1.18	14:41	0.49	15:36	1.24
12:02	1.21	12:52	1.50	13:47	1.02	14:42	0.47	15:37	1.35
12:03	1.26	12:53	1.50	13:48	0.96	14:43	0.45	15:38	1.22
12:04	1.27	12:54	1.49	13:49	0.96	14:44	0.42	15:39	1.27
12:05	1.27	12:55	1.42	13:50	0.97	14:45	0.30	15:40	1.28
12:06	1.21	12:56	1.46	13:51	1.00	14:46	0.20	15:41	1.14
12:07	1.11	12:57	1.47	13:52	1.00	14:47	0.26	15:42	1.20
12:08	1.06	12:58	1.45	13:53	1.14	14:48	0.40	15:43	1.18
12:09	1.04	12:59	1.38	13:54	1.28	14:49	0.30	15:44	1.28
12:10	1.08	13:00	1.51	13:55	1.39	14:50	0.22	15:45	1.20
12:11	1.13	13:01	1.48	13:56	1.52	14:51	0.29	15:46	1.20
12:12	1.05	13:02	1.34	13:57	1.56	14:52	0.43	15:47	1.21
12:13	1.07	13:03	1.41	13:58	1.58	14:53	0.33	15:48	1.25
12:14	0.99	13:04	1.40	13:59	1.61	14:54	0.30	15:49	1.31
12:15	1.03	13:05	1.32	14:00	1.55	14:55	0.36	15:50	1.36
12:16	1.20	13:06	1.36	14:01	1.54	14:56	0.34	15:51	1.34
12:17	1.27	13:07	1.32	14:02	1.44	14:57	0.46	15:52	1.38
12:18	1.32	13:08	1.23	14:03	1.49	14:58	0.31	15:53	1.43
12:19	1.51	13:09	1.23	14:04	1.42	14:59	0.25	15:54	1.50
12:20	1.67	13:10	1.39	14:05	1.35	15:00	0.29	15:55	1.45
12:21	1.61	13:11	1.35	14:06	1.33	15:01	0.55	15:56	1.48
12:22	1.59	13:12	1.28	14:07	1.39	15:02	0.49	15:57	1.46
12:23	1.59	13:13	1.30	14:08	1.44	15:03	0.62	15:58	1.50
12:24	1.46	13:14	1.34	14:09	1.51	15:04	0.68	15:59	1.49
12:25	1.36	13:15	1.43	14:10	1.52	15:05	0.73	16:00	1.50
12:26	1.39	13:16	1.32	14:11	1.54	15:06	0.74	16:01	1.56
12:27	1.29	13:17	1.33	14:12	1.65	15:07	0.74	16:02	1.47
12:28	1.27	13:18	1.27	14:13	1.73	15:08	0.84	16:03	1.49
12:29	1.27	13:19	1.34	14:14	1.70	15:09	0.84	16:04	1.49
12:30	1.27	13:20	1.40	14:15	1.58	15:10	0.80	16:05	1.42
12:31	1.07	13:21	1.42	14:16	1.57	15:11	0.89	16:06	1.39
12:32	1.04	13:22	1.50	14:17	1.62	15:12	0.85	16:07	1.43
12:33	0.90	13:23	1.45	14:18	1.64	15:13	0.91	16:08	1.43
12:34	1.02	13:24	1.40	14:19	1.54	15:14	0.82	16:09	1.40
12:35	1.00	13:25	1.41	14:20	1.62	15:15	0.82	16:10	1.45
12:36	1.23	13:26	1.32	14:21	1.54	15:16	0.82	16:11	1.47
12:37	1.20	13:27	1.26	14:22	1.52	15:17	0.88	16:12	1.47
12:38	1.24	13:28	1.41	14:23	1.55	15:18	0.87	16:13	1.50
12:39	1.29	13:29	1.45	14:24	1.57	15:19	0.86	16:14	1.51
12:40	1.31	13:30	1.43	14:25	1.61	15:20	1.02	16:15	1.39
12:41	1.18	13:31	1.38	14:26	1.54	15:21	0.94	16:16	1.43
12:42	1.29	13:32	1.36	14:27	1.59	15:22	1.02	16:17	1.52
12:43	1.24	13:33	1.34	14:28	1.55	15:23	0.90	16:18	1.44
Avg.	1.26	Avg.	1.38	Avg.	1.41	Avg.	0.62	Avg.	1.35

CEMs Opacity Data (mg/m<sup>3</sup> at Actual O<sub>2</sub>)Client Name **Amata B.Grimm Power**  
Plant Name **ABPR 3**Date **22-Oct-22**  
Location **HR8032**

Run No.1		Run No.2		Run No.3		Run No.4		Run No.5	
Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )	Time	Dust (mg/m <sup>3</sup> )
10:00	0.77	10:55	0.57	11:50	0.66	12:45	0.42	13:40	0.63
10:01	0.74	10:56	0.59	11:51	0.66	12:46	0.44	13:41	0.67
10:02	0.73	10:57	0.56	11:52	0.66	12:47	0.46	13:42	0.68
10:03	0.71	10:58	0.56	11:53	0.63	12:48	0.54	13:43	0.65
10:04	0.68	10:59	0.56	11:54	0.63	12:49	0.47	13:44	0.62
10:05	0.68	11:00	0.55	11:55	0.65	12:50	0.52	13:45	0.63
10:06	0.65	11:01	0.57	11:56	0.65	12:51	0.52	13:46	0.65
10:07	0.65	11:02	0.61	11:57	0.65	12:52	0.53	13:47	0.64
10:08	0.58	11:03	0.57	11:58	0.67	12:53	0.51	13:48	0.69
10:09	0.57	11:04	0.58	11:59	0.68	12:54	0.50	13:49	0.69
10:10	0.58	11:05	0.66	12:00	0.63	12:55	0.51	13:50	0.71
10:11	0.58	11:06	0.66	12:01	0.62	12:56	0.52	13:51	0.70
10:12	0.55	11:07	0.61	12:02	0.60	12:57	0.54	13:52	0.71
10:13	0.54	11:08	0.57	12:03	0.60	12:58	0.54	13:53	0.69
10:14	0.51	11:09	0.56	12:04	0.59	12:59	0.52	13:54	0.67
10:15	0.53	11:10	0.57	12:05	0.55	13:00	0.51	13:55	0.65
10:16	0.50	11:11	0.59	12:06	0.54	13:01	0.53	13:56	0.63
10:17	0.53	11:12	0.61	12:07	0.54	13:02	0.54	13:57	0.63
10:18	0.54	11:13	0.60	12:08	0.54	13:03	0.52	13:58	0.63
10:19	0.55	11:14	0.58	12:09	0.54	13:04	0.53	13:59	0.59
10:20	0.56	11:15	0.58	12:10	0.54	13:05	0.56	14:00	0.57
10:21	0.59	11:16	0.60	12:11	0.54	13:06	0.61	14:01	0.55
10:22	0.60	11:17	0.62	12:12	0.53	13:07	0.66	14:02	0.52
10:23	0.64	11:18	0.60	12:13	0.56	13:08	0.65	14:03	0.50
10:24	0.64	11:19	0.61	12:14	0.56	13:09	0.61	14:04	0.46
10:25	0.70	11:20	0.62	12:15	0.53	13:10	0.61	14:05	0.44
10:26	0.67	11:21	0.61	12:16	0.53	13:11	0.60	14:06	0.38
10:27	0.68	11:22	0.60	12:17	0.56	13:12	0.64	14:07	0.36
10:28	0.65	11:23	0.62	12:18	0.57	13:13	0.64	14:08	0.32
10:29	0.68	11:24	0.64	12:19	0.58	13:14	0.60	14:09	0.29
10:30	0.68	11:25	0.60	12:20	0.62	13:15	0.58	14:10	0.28
10:31	0.66	11:26	0.60	12:21	0.65	13:16	0.61	14:11	0.29
10:32	0.64	11:27	0.63	12:22	0.63	13:17	0.60	14:12	0.30
10:33	0.65	11:28	0.67	12:23	0.66	13:18	0.57	14:13	0.30
10:34	0.64	11:29	0.70	12:24	0.70	13:19	0.54	14:14	0.31
10:35	0.67	11:30	0.74	12:25	0.71	13:20	0.55	14:15	0.31
10:36	0.61	11:31	0.73	12:26	0.75	13:21	0.56	14:16	0.30
10:37	0.58	11:32	0.73	12:27	0.78	13:22	0.59	14:17	0.26
10:38	0.59	11:33	0.73	12:28	0.78	13:23	0.59	14:18	0.29
10:39	0.59	11:34	0.75	12:29	0.78	13:24	0.54	14:19	0.33
10:40	0.61	11:35	0.74	12:30	0.75	13:25	0.55	14:20	0.37
10:41	0.62	11:36	0.73	12:31	0.75	13:26	0.52	-	-
10:42	0.61	11:37	0.71	12:32	0.71	13:27	0.53	-	-
10:43	0.62	11:38	0.71	12:33	0.69	13:28	0.56	-	-
10:44	0.60	11:39	0.72	12:34	0.65	13:29	0.61	-	-
10:45	0.57	11:40	0.71	12:35	0.62	13:30	0.59	-	-
10:46	0.58	11:41	0.71	12:36	0.61	13:31	0.58	-	-
10:47	0.60	11:42	0.75	12:37	0.60	13:32	0.65	-	-
10:48	0.60	11:43	0.70	12:38	0.59	13:33	0.67	-	-
Avg.	0.62	Avg.	0.64	Avg.	0.63	Avg.	0.56	Avg.	0.51



CEMs Opacity Data (mg/m<sup>3</sup> at Actual O<sub>2</sub>)

Client Name Amata B.Grimm Power  
Plant Name ABPR 3

Date	23-Oct-22
Location	HR9G32

Run No.11		Run No.12		Run No.13		Run No.14		Run No.15	
Time	Dust (mg/m3)	Time	Dust (mg/m3)	Time	Dust (mg/m3)	Time	Dust (mg/m3)	Time	Dust (mg/m3)
12:45	0.67	13:40	0.45	14:35	0.47	15:30	0.34	16:25	0.37
12:46	0.63	13:41	0.45	14:36	0.46	15:31	0.37	16:26	0.42
12:47	0.66	13:42	0.45	14:37	0.47	15:32	0.37	16:27	0.38
12:48	0.64	13:43	0.45	14:38	0.44	15:33	0.37	16:28	0.39
12:49	0.65	13:44	0.42	14:39	0.47	15:34	0.39	16:29	0.45
12:50	0.62	13:45	0.43	14:40	0.44	15:35	0.36	16:30	0.45
12:51	0.63	13:46	0.42	14:41	0.44	15:36	0.38	16:31	0.45
12:52	0.70	13:47	0.45	14:42	0.46	15:37	0.33	16:32	0.45
12:53	0.70	13:48	0.48	14:43	0.47	15:38	0.33	16:33	0.45
12:54	0.70	13:49	0.50	14:44	0.48	15:39	0.34	16:34	0.43
12:55	0.70	13:50	0.57	14:45	0.51	15:40	0.34	16:35	0.43
12:56	0.68	13:51	0.59	14:46	0.55	15:41	0.30	16:36	0.45
12:57	0.71	13:52	0.62	14:47	0.58	15:42	0.34	16:37	0.44
12:58	0.78	13:53	0.65	14:48	0.56	15:43	0.36	16:38	0.42
12:59	0.80	13:54	0.67	14:49	0.54	15:44	0.36	16:39	0.44
13:00	0.76	13:55	0.66	14:50	0.53	15:45	0.41	16:40	0.44
13:01	0.73	13:56	0.62	14:51	0.54	15:46	0.42	16:41	0.44
13:02	0.69	13:57	0.62	14:52	0.55	15:47	0.41	16:42	0.43
13:03	0.65	13:58	0.70	14:53	0.52	15:48	0.40	16:43	0.46
13:04	0.59	13:59	0.75	14:54	0.54	15:49	0.40	16:44	0.47
13:05	0.56	14:00	0.76	14:55	0.53	15:50	0.41	16:45	0.42
13:06	0.54	14:01	0.76	14:56	0.58	15:51	0.40	16:46	0.43
13:07	0.51	14:02	0.74	14:57	0.57	15:52	0.38	16:47	0.41
13:08	0.52	14:03	0.70	14:58	0.59	15:53	0.38	16:48	0.41
13:09	0.53	14:04	0.62	14:59	0.55	15:54	0.37	16:49	0.43
13:10	0.55	14:05	0.60	15:00	0.55	15:55	0.36	16:50	0.43
13:11	0.60	14:06	0.56	15:01	0.54	15:56	0.33	16:51	0.39
13:12	0.60	14:07	0.56	15:02	0.53	15:57	0.36	16:52	0.39
13:13	0.66	14:08	0.54	15:03	0.50	15:58	0.31	16:53	0.43
13:14	0.67	14:09	0.54	15:04	0.50	15:59	0.37	16:54	0.39
13:15	0.62	14:10	0.54	15:05	0.50	16:00	0.23	16:55	0.39
13:16	0.57	14:11	0.54	15:06	0.46	16:01	0.23	16:56	0.38
13:17	0.56	14:12	0.52	15:07	0.43	16:02	0.25	16:57	0.40
13:18	0.53	14:13	0.54	15:08	0.40	16:03	0.26	16:58	0.40
13:19	0.53	14:14	0.54	15:09	0.35	16:04	0.26	16:59	0.36
13:20	0.52	14:15	0.57	15:10	0.32	16:05	0.34	17:00	0.40
13:21	0.53	14:16	0.60	15:11	0.29	16:06	0.37	17:01	0.38
13:22	0.53	14:17	0.60	15:12	0.28	16:07	0.39	17:02	0.36
13:23	0.57	14:18	0.59	15:13	0.26	16:08	0.40	17:03	0.35
13:24	0.57	14:19	0.62	15:14	0.22	16:09	0.41	17:04	0.36
13:25	0.59	14:20	0.60	15:15	0.23	16:10	0.39	17:05	0.36
13:26	0.60	14:21	0.58	15:16	0.25	16:11	0.40	17:06	0.35
13:27	0.58	14:22	0.57	15:17	0.24	16:12	0.38	17:07	0.37
13:28	0.55	14:23	0.57	15:18	0.26	16:13	0.41	17:08	0.34
13:29	0.56	14:24	0.53	15:19	0.32	16:15	0.37	17:09	0.33
13:30	0.53	14:25	0.53	15:20	0.27	16:16	0.37	17:10	0.32
13:31	0.55	14:26	0.51	15:21	0.30	16:16	0.35	17:11	0.33
13:32	0.56	14:27	0.48	15:22	0.33	16:17	0.34	17:12	0.32
13:33	0.53	14:28	0.45	15:23	0.34	16:18	0.30	17:13	0.35
Avg.	0.61	Avg.	0.57	Avg.	0.64	Avg.	0.35	Avg.	0.40

# CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

12 Jul 22	Barometric Pressure (mm.Hg)	Serial No.
12 Jan 23	Relative Humidity (%)	Correction Factor (Vt)
	Temperature (°C)	Next Calibration Date
	<b>Reference Dry Gas Meter Data</b>	
	Reference Dry Gas Meter ID.	
	SKW_# 50647	
	-170722-BKX_F50647	
	606040	
	606040	

C-120722-BKK\_FS0647

Console Control Meter Data

Calibration No. \_\_\_\_\_  
Dry Gas Meter No. \_\_\_\_\_Serial No. \_\_\_\_\_  
Model No. \_\_\_\_\_

②	HV
---	----

$\Delta H$ (mm H <sub>2</sub> O)	$\Theta$ Minutes	Reference Dry Gas Meter Calibration				Consistent Control Dry Gas Meter			
		V <sub>1</sub> (Liters)		T <sub>1</sub>		V <sub>2</sub> (Liters)		T <sub>2</sub>	
		Final	Total	Final	Total	Final	Total	Final	Total
15	12.48	150.00	0.00	150.00	33.0	182.5068	162.5440	162.60	32.0
25	3.66	150.00	0.00	150.00	33.0	182.7012	162.6110	163.20	32.0
50	5.68	150.00	0.00	150.00	33.0	182.9384	162.6340	163.40	34.0
60	5.25	150.00	0.00	150.00	33.0	183.1022	162.6490	163.20	34.0
120	4.26	160.00	0.00	160.00	33.0	183.7720	183.1160	163.30	33.0

Y Ratio of reading of reference to dry gas meter. tolerance for individual values  $\pm 0.02$  (on average)

$\Delta t$  On-line pressure differential that equates to 21.24 in. of air @ 25°C and 760 mm of mercury. mmH<sub>2</sub>O. tolerance for individual values  $\pm 5.0$

Procedure 40 CFR 60 APP A METH. SEC 5.3 & 7

Calibrated by: Robert S. (Mr. Robert Surahman)  
 Approved by: [Signature] (Mr. S. Field Scientist(3))



## Stopwatch Calibration Test Report

Calibration Date	3 Jul 22	Next Cal. Date	3 Jan 23
Barometric Pressure (mmHg)	756	Temperature (°C)	31.0
Relative Humidity (%)	62.0		

### Reference Stopwatch Data

Stopwatch ID No.	E18061
Model	F808
Serial No.	-
Calibration Date	8 Sep 20
Certificate No	E-2009018

Console Control   Meter Data

Dry Gas Meter No. BKK\_FS0547  
Model: XC-572-V  
Serial No. 1606040

Run No.	Time Actual (m.ss.ms)	Time Reading (m.ss)	Diff. (ms)	Diff. (min)
1	5:00:12	5:00	12	0.00020
2	5:00:12	5:00	12	0.00020
3	5:00:12	5:00	12	0.00020
4	5:00:12	5:00	12	0.00020
5	5:00:12	5:00	12	0.00020
6	5:00:12	5:00	12	0.00020
7	5:00:12	5:00	10	0.00017
8	5:00:14	5:00	15	0.00025
9	5:00:14	5:00	14	0.00023
10	5:00:14	5:00	11	0.00018
			Average	0.00020
			SD	0.00002

Calibrate by

Mr. Prasert Surakhan

Field Scientist (3)

Approved by \_\_\_\_\_

Mr Samart Roo-ngan

Specialist (1)



## DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date	3 Jul 22	Ambient Temperature (°C)	31
Calibration sheet No.	C-030722-BKH_F50548	Relative Humidity (%)	62
Digital Temperature ID	BKH_F50548	Reference Temperature ID	BKH_F51144
Console Serial No.	1060640	Serial No.	201090006013
Console Model	XC-572-V	Model	Digicon-CC-VT-MS
		Next Calibrate	31 Jan 23

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	1	1	
	25	28	1	
	50	52	2	
	100	102	2	
	150	152	2	
	200	202	2	
	250	252	2	
	300	302	2	
	500	502	2	
Probe	1000	1002	2	
	1200	1202	2	
	100	101	1	
	125	126	1	
Oven	150	151	1	
	100	101	1	
	125	126	1	
Filter	150	151	1	
	100	101	1	
	125	126	1	
Exit	150	151	1	
	0	1	1	
	10	11	1	
Meter	20	21	1	
	0	2	2	
	25	27	2	
AUX	50	52	2	
	0	2	2	
	25	27	2	
	50	52	2	

Calibrated by

( Mr.Prasert Surakhan )

Field Scientist (3)

Approved by \_\_\_\_\_

(Mr Samart Roo-ngan)

Specialist (1)





### Pitot Tube Calibration Data

Pitot Tube Identification Number: BKK\_F50551 Calibration Date: 3 Jul 22  
Lab test duct Number: 258-1-13-01 Standard Pitot ID: BKK\_FS0441  
Calibration Sheet No.: C-030722-BKK\_F50551 Cp Standard: 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube ( $\Delta P$ , mm H <sub>2</sub> O)	Type s pitot tube ( $\Delta P$ , mm H <sub>2</sub> O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			$\bar{C}_p$	0.842	0.842

$$Cp(s) = Cp \cdot \sqrt{\frac{\Delta P(s)}{\Delta P(s)}}$$

$$\bar{C}_{p(A)} - \bar{C}_{p(B)} \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum [Cp(s) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by

*Prasert S.*

Mr.Prasert Surakhian  
Field Scientist (3)

Approved by

*S.P.*

Mr.Samart Roo-ngan  
Specialist (1)

FORM NO. P-03-018 REVISED 11/11/12



### Pitot Tube Calibration Data

Pitot Tube Identification Number: BKK\_F50552 Calibration Date: 3 Jul 22  
Lab test duct Number: 258-1-13-01 Standard Pitot ID: BKK\_FS0441  
Calibration Sheet No.: C-030722-BKK\_F50552 Cp Standard: 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube ( $\Delta P$ , mm H <sub>2</sub> O)	Type s pitot tube ( $\Delta P$ , mm H <sub>2</sub> O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			$\bar{C}_p$	0.842	0.842

$$Cp(s) = Cp \cdot \sqrt{\frac{\Delta P(s)}{\Delta P(s)}}$$

$$\bar{C}_{p(A)} - \bar{C}_{p(B)} \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum [Cp(s) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by

*Prasert S.*

Mr.Prasert Surakhian  
Field Scientist (3)

Approved by

*S.P.*

Mr.Samart Roo-ngan  
Specialist (1)

FORM NO. P-03-018 REVISED 11/11/12



### PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

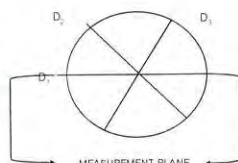
Calibration Date		3 Jul 22		Nozzle Set ID		BKK_F50553	
Calibration Sheet No		C-030722-BKK_F50553		Vernier Caliper ID		BKK_F50626	
Nozzle ID #	Nozzle Diameter (cm.)			HI - Lo $\Delta D$	$(D_1 + D_2 + D_3) / 3$ $D_{avg}$		
	$D_1$	$D_2$	$D_3$				
1	0.310	0.310	0.310	0.000	0.310		
2	0.450	0.450	0.450	0.000	0.450		
3	0.635	0.635	0.635	0.000	0.635		
4	0.790	0.790	0.790	0.000	0.790		
5	0.950	0.950	0.950	0.000	0.950		
6	1.110	1.110	1.110	0.000	1.110		
7	1.270	1.270	1.270	0.000	1.270		

Where:

D<sub>1</sub>, D<sub>2</sub>, D<sub>3</sub> : There different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

$\Delta D$  : Maximum distance between any two diameters, must be  $\leq 0.100$  mm.

D<sub>avg</sub> :  $(D_1 + D_2 + D_3) / 3$



Calibrated by

*Prasert S.*

Mr.Prasert Surakhian  
Field Scientist (3)

Approved by

*S.P.*

Mr.Samart Roo-ngan  
Specialist (1)

FORM NO. P-03-018 REVISED 11/11/12



**PENTA**  
CALIBRATION

**PENTA CALIBRATION CO., LTD.**  
55/124 The Connect 33 Village Kanchanaphisek Road  
Dokmai Praveh Bangkok 10250  
Tel : +66 (0) 2069-9773  
www.pentalab.com

### Certificate of Calibration

Represent to Certificate of Calibration : PTC/07/21161

Certificate No. PTC/07/21161 Page: 1 of 2  
Equipment: Digital Balance Condition: Normal  
Manufacturer: Sartorius Serial No: 38304165  
Model: SECURA224 1S ID No: BKK\_EN0309  
Type of Balance: Single interval

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

Environment Condition: Temperature: 23.8 °C  $\pm$  0.4 °C  
Humidity: 58.1 %RH  $\pm$  0.7 %RH  
Air density: 1.18 kg/m<sup>3</sup>

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakarn 40, Phatthanakarn Rd.,  
Khwaeng Phatthanakarn, Khet Suan Luang, Bangkok 10250

The Method used: In house method, PTC-WI-07 base on Euramet cg 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co., Ltd.  
NSC-ONSC Accreditation No. Calibration 0189

Date Received: December 16, 2021

Calibration Date: December 16, 2021

Issued Date: December 20, 2021

Calibration By: Mr Keattisak Kerdito

*Keattisak Kerdito*  
(Mr Keattisak Kalasin)  
Reviewed by:

Approved By: *Keattisak Kerdito*  
(Mr Keattisak Kerdito)  
Laboratory Manager

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

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (K=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The effect that the results relate only to the items calibrated.

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www.pentacal.com

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Certificate No : PTC/07/21161

Page : 2 of 2

Measurement Results:

Without Adjustment :

Function Calibration: Internal Calibration

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity

Figure 1. Eccentricity test

Eccentricity test		100	(g)			
Position (g)		1	2	3	4	5
0.0000	0.0000	0.0000	-0.0001	-0.0001		
Maximum deviation:		0.0001				

Repeatability Test: Weight to be 1/2  $\leq L_1 \leq$  Maximum capacity

Determination of the standard deviation of weighing balance: Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
200	0.00004

Error of indication, from nominal value: Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.00013	2.37
0.01	0.01000	0.0100	0.0000	0.00028	2.00
0.1	0.10000	0.1000	0.0000	0.00015	2.12
1	1.00000	1.0000	0.0000	0.00014	2.16
2	2.00000	2.0000	0.0000	0.00014	2.20
5	5.00001	5.0000	0.0000	0.00014	2.20
10	10.00000	10.0000	0.0000	0.00014	2.20
20	20.00003	20.0000	0.0000	0.00014	2.18
50	50.00004	50.0000	0.0000	0.00015	2.11
100	100.00004	100.0000	0.0000	0.00018	2.05
200	200.00011	200.0000	0.0001	0.00025	2.00

Note: Weight of adjust (g)

The End of Certificate

PTC/07/21161



Lot No. 22117494-1

### ANALYZER CALIBRATION DATA

Client Name : Amata B. Grimm Power (Rayong) 3 Limited  
Date : 21 Oct 22  
Location : HRSG 31  
Test Operator : Anusrit M.  
O<sub>2</sub> ANALYZER  
Model : TELEDYNE API 200EH  
Span (%) : 25

Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.04	0.16
Low-Level Gas	7.93	8.09	0.36
Span Gas	16.06	15.58	0.12

NO<sub>x</sub> ANALYZER  
Model : TELEDYNE API 200EH  
Span (ppm) : 100

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.07	0.05
Low-Level Gas	50.32	50.33	0.23
Span Gas	79.86	80.55	0.22

SO<sub>2</sub> ANALYZER  
Model : TELEDYNE API 100EH  
Span (ppm) : 100

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.15	0.15
Low-Level Gas	50.27	50.12	0.54
Span Gas	79.95	78.00	0.32

CO ANALYZER  
Model : TELEDYNE API 300EM  
Span (ppm) : 100

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.04	0.02
Low-Level Gas	49.99	50.77	0.11
Span Gas	80.10	79.56	0.23

Calibrated by

Anusrit M.  
(Mr. Anusrit Moungpair)  
Environmental Field Scientist (2)

FORM NO. F-06-104 REVISION NO. - ISSUE DATE 306/16  
ALS Laboratory Group



Lot No. 22117494-1

### SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client Name : Amata B. Grimm Power (Rayong) 3 Limited  
Date : 21 Oct 22  
Location : HRSG 31  
Test Operator : Anusrit M.

O<sub>2</sub> ANALYZER  
Cylinder Conc. (%) : 16.06  
Span (%) : 25

Cylinder Conc. (%)	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.00	0.11	0.44	0.12	0.04
Upscale Gas	15.58	15.45	0.52	15.40	0.72

NO<sub>x</sub> ANALYZER  
Cylinder Conc. (ppm) : 79.86  
Span (ppm) : 100

Cylinder Conc. (ppm)	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.02	0.11	0.05	0.14	0.03
Upscale Gas	80.55	80.12	0.43	80.44	0.11

SO<sub>2</sub> ANALYZER  
Cylinder Conc. (ppm) : 79.95  
Span (ppm) : 100

Cylinder Conc. (ppm)	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.00	-0.05	0.05	-0.20	0.15
Upscale Gas	78.00	78.10	0.10	78.00	0.10

CO ANALYZER  
Cylinder Conc. (ppm) : 80.10  
Span (ppm) : 100

Cylinder Conc. (ppm)	Initial Values		Final Values		Drift (% of Span)
	System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.04	0.11	0.07	0.08	0.03
Upscale Gas	79.56	79.67	0.11	80.53	0.85

Calibrated by

Anusrit M.  
(Mr. Anusrit Moungpair)  
Environmental Field Scientist (2)

FORM NO. F-06-104 REVISION NO. - ISSUE DATE 306/16  
ALS Laboratory Group



### CEMs Data

Client Name : Amata B. Grimm Power (Rayong) 3 Limited  
Plant Name : ASBR 3  
Date : 21 Oct 22  
Location : HRSG 31

Run No. 1										Run No. 2									
Time Base: 21 min										Time Base: 21 min									
Date	Time	SO <sub>2</sub>	NO <sub>x</sub>	CO	CO <sub>2</sub>	CO <sub>2</sub>	CO <sub>2</sub>	CO <sub>2</sub>	CO <sub>2</sub>	Date	Time	SO <sub>2</sub>	NO <sub>x</sub>	CO	CO <sub>2</sub>	CO <sub>2</sub>	CO <sub>2</sub>	CO <sub>2</sub>	
21 Oct 22	10:45	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:01	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:47	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:02	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:48	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:03	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:49	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:04	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:50	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:05	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:51	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:06	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:52	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:07	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:53	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:08	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:54	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:09	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:55	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:10	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:56	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:11	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:57	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:12	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:58	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:13	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	10:59	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:14	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:00	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:15	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:01	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:16	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:02	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:17	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:03	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:18	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:04	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:19	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:05	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:20	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:06	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:21	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:07	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:22	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:08	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:23	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:09	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:24	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:10	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:25	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:11	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:26	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:12	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:27	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:13	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:28	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:14	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:29	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:15	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:30	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:16	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:31	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:17	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:32	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:18	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:33	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:19	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:34	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:20	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:35	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:21	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:36	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:22	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:37	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:23	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:38	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:24	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:39	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:25	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:40	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:26	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:41	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:27	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:42	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:28	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:43	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:29	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:44	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:30	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:45	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:31	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:46	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:32	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:47	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:33	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:48	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:34	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:49	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:35	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:50	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:36	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:51	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:37	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:52	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:38	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:53	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:39	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:54	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:40	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:55	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:41	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:56	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:42	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:57	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:43	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:58	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:44	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	11:59	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:45	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	12:00	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:46	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	12:01	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:47	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	12:02	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:48	0.00	16.34	1.43	14.29	14.29	14.29	14.29	14.29	21 Oct 22	12:03	0.00	16.34	1.43	14.29	14.29	14.29	14.29	
21 Oct 22	11:49	0																	



21	11.32	408093.3	94.8	21-01-22	17.07	444754.2	93.2	21-01-22	13.02	457000.0	93.8	21-01-22	13.01	444400.0
22	11.33	440778.2	94.8	21-01-22	12.08	444715.6	93.2	21-01-22	13.03	454700.2	93.8	21-01-22	13.08	440874.4
23	11.34	426415.1	94.9	21-01-22	12.08	440908.8	93.2	21-01-22	13.04	450338.0	93.7	21-01-22	13.08	447791.8
24	11.35	440873.2	94.9	21-01-22	12.10	444140.3	93.2	21-01-22	13.05	450317.7	93.8	21-01-22	14.05	440159.5
25	11.36	443191.8	94.8	21-01-22	12.11	443417.2	93.3	21-01-22	13.06	443025.3	93.8	21-01-22	14.01	443024.4
26	11.37	463140.4	94.3	21-01-22	12.12	444887.9	93.2	21-01-22	13.07	441811.0	94.1	21-01-22	14.02	441774.4
27	11.38	443199.4	95.1	21-01-22	12.13	445047.7	93.1	21-01-22	13.08	441813.4	94.2	21-01-22	14.03	441293.5
28	11.39	443108.4	94.9	21-01-22	12.13	445047.4	93.8	21-01-22	13.09	441814.8	93.6	21-01-22	14.03	440914.4



### CEMs Data

Client Name	Amata B. Grimm Power (Rayong) 3 Limited	Location	HRSG 3
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Run No. 5				Run No. 7				Run No. 8			
Date	Time	Fluores	Temperature	Date	Time	Fluores	Temperature	Date	Time	Fluores	Temperature
21-Jan-22	14:10	44021.9	NA.7	21-Jan-22	15:05	44513.9	NA.1	21-Jan-22	15:00	44487.8	NA.7
21-Jan-22	14:11	44074.9	NA.7	21-Jan-22	15:06	44530.4	NA.1	21-Jan-22	15:01	44500.2	NA.8
21-Jan-22	14:12	44127.9	NA.7	21-Jan-22	15:07	44546.9	NA.1	21-Jan-22	15:02	44516.7	NA.8
21-Jan-22	14:13	44180.9	NA.8	21-Jan-22	15:08	44563.4	NA.1	21-Jan-22	15:03	44533.2	NA.8
21-Jan-22	14:14	44234.1	NA.8	21-Jan-22	15:09	44580.9	NA.0	21-Jan-22	15:04	44549.7	NA.8
21-Jan-22	14:15	44287.1	NA.8	21-Jan-22	15:10	44597.4	NA.0	21-Jan-22	15:05	44566.2	NA.8
21-Jan-22	14:16	44340.1	NA.7	21-Jan-22	15:11	44613.9	NA.9	21-Jan-22	15:06	44582.7	NA.8
21-Jan-22	14:17	44393.7	NA.7	21-Jan-22	15:12	44630.2	NA.7	21-Jan-22	15:07	44599.2	NA.8
21-Jan-22	14:18	44447.1	NA.7	21-Jan-22	15:13	44646.7	NA.5	21-Jan-22	15:08	44615.7	NA.8
21-Jan-22	14:19	44500.5	NA.8	21-Jan-22	15:14	44663.2	NA.1	21-Jan-22	15:09	44632.2	NA.8
21-Jan-22	14:20	44553.9	NA.8	21-Jan-22	15:15	44679.7	NA.2	21-Jan-22	15:10	44648.7	NA.8
21-Jan-22	14:21	44607.4	NA.8	21-Jan-22	15:16	44696.2	NA.2	21-Jan-22	15:11	44665.2	NA.8
21-Jan-22	14:22	44660.9	NA.8	21-Jan-22	15:17	44712.7	NA.2	21-Jan-22	15:12	44681.7	NA.8
21-Jan-22	14:23	44714.4	NA.8	21-Jan-22	15:18	44729.2	NA.1	21-Jan-22	15:13	44698.2	NA.8
21-Jan-22	14:24	44767.9	NA.8	21-Jan-22	15:19	44745.7	NA.1	21-Jan-22	15:14	44714.7	NA.8
21-Jan-22	14:25	44821.4	NA.8	21-Jan-22	15:20	44762.2	NA.0	21-Jan-22	15:15	44731.2	NA.8
21-Jan-22	14:26	44874.9	NA.8	21-Jan-22	15:21	44778.7	NA.0	21-Jan-22	15:16	44747.7	NA.8
21-Jan-22	14:27	44928.4	NA.8	21-Jan-22	15:22	44795.2	NA.0	21-Jan-22	15:17	44764.2	NA.8
21-Jan-22	14:28	44981.9	NA.8	21-Jan-22	15:23	44811.7	NA.0	21-Jan-22	15:18	44780.7	NA.8
21-Jan-22	14:29	45035.4	NA.8	21-Jan-22	15:24	44828.2	NA.0	21-Jan-22	15:19	44797.2	NA.8
21-Jan-22	14:30	45088.9	NA.8	21-Jan-22	15:25	44844.7	NA.0	21-Jan-22	15:20	44813.7	NA.8
21-Jan-22	14:31	45142.4	NA.8	21-Jan-22	15:26	44861.2	NA.0	21-Jan-22	15:21	44830.2	NA.8
21-Jan-22	14:32	45195.9	NA.8	21-Jan-22	15:27	44877.7	NA.0	21-Jan-22	15:22	44846.7	NA.8
21-Jan-22	14:33	45249.4	NA.8	21-Jan-22	15:28	44894.2	NA.0	21-Jan-22	15:23	44863.2	NA.8
21-Jan-22	14:34	45302.9	NA.8	21-Jan-22	15:29	44910.7	NA.0	21-Jan-22	15:24	44879.7	NA.8
21-Jan-22	14:35	45356.4	NA.8	21-Jan-22	15:30	44927.2	NA.0	21-Jan-22	15:25	44896.2	NA.8
21-Jan-22	14:36	45409.9	NA.8	21-Jan-22	15:31	44943.7	NA.0	21-Jan-22	15:26	44912.7	NA.8
21-Jan-22	14:37	45463.4	NA.8	21-Jan-22	15:32	44960.2	NA.0	21-Jan-22	15:27	44929.2	NA.8
21-Jan-22	14:38	45516.9	NA.8	21-Jan-22	15:33	44976.7	NA.0	21-Jan-22	15:28	44945.7	NA.8
21-Jan-22	14:39	45570.4	NA.8	21-Jan-22	15:34	44993.2	NA.0	21-Jan-22	15:29	44962.2	NA.8
21-Jan-22	14:40	45623.9	NA.8	21-Jan-22	15:35	45009.7	NA.0	21-Jan-22	15:30	44978.7	NA.8
21-Jan-22	14:41	45677.4	NA.8	21-Jan-22	15:36	45026.2	NA.0	21-Jan-22	15:31	44995.2	NA.8
21-Jan-22	14:42	45730.9	NA.8	21-Jan-22	15:37	45042.7	NA.0	21-Jan-22	15:32	45011.7	NA.8
21-Jan-22	14:43	45784.4	NA.8	21-Jan-22	15:38	45059.2	NA.0	21-Jan-22	15:33	45028.2	NA.8
21-Jan-22	14:44	45837.9	NA.8	21-Jan-22	15:39	45075.7	NA.0	21-Jan-22	15:34	45044.7	NA.8
21-Jan-22	14:45	45891.4	NA.8	21-Jan-22	15:40	45092.2	NA.0	21-Jan-22	15:35	45061.2	NA.8
21-Jan-22	14:46	45944.9	NA.8	21-Jan-22	15:41	45108.7	NA.0	21-Jan-22	15:36	45077.7	NA.8
21-Jan-22	14:47	45998.4	NA.8	21-Jan-22	15:42	45125.2	NA.0	21-Jan-22	15:37	45094.2	NA.8
21-Jan-22	14:48	46051.9	NA.8	21-Jan-22	15:43	45141.7	NA.0	21-Jan-22	15:38	45110.7	NA.8
21-Jan-22	14:49	46105.4	NA.8	21-Jan-22	15:44	45158.2	NA.0	21-Jan-22	15:39	45127.2	NA.8
21-Jan-22	14:50	46158.9	NA.8	21-Jan-22	15:45	45174.7	NA.0	21-Jan-22	15:40	45143.7	NA.8
21-Jan-22	14:51	46212.4	NA.8	21-Jan-22	15:46	45191.2	NA.0	21-Jan-22	15:41	45160.2	NA.8
21-Jan-22	14:52	46265.9	NA.8	21-Jan-22	15:47	45207.7	NA.0	21-Jan-22	15:42	45176.7	NA.8
21-Jan-22	14:53	46319.4	NA.8	21-Jan-22	15:48	45224.2	NA.0	21-Jan-22	15:43	45193.2	NA.8
21-Jan-22	14:54	46372.9	NA.8	21-Jan-22	15:49	45240.7	NA.0	21-Jan-22	15:44	45209.7	NA.8
21-Jan-22	14:55	46426.4	NA.8	21-Jan-22	15:50	45257.2	NA.0	21-Jan-22	15:45	45226.2	NA.8
21-Jan-22	14:56	46479.9	NA.8	21-Jan-22	15:51	45273.7	NA.0	21-Jan-22	15:46	45242.7	NA.8
21-Jan-22	14:57	46533.4	NA.8	21-Jan-22	15:52	45290.2	NA.0	21-Jan-22	15:47	45259.2	NA.8
21-Jan-22	14:58	46586.9	NA.8	21-Jan-22	15:53	45306.7	NA.0	21-Jan-22	15:48	45275.7	NA.8
21-Jan-22	14:59	46640.4	NA.8	21-Jan-22	15:54	45323.2	NA.0	21-Jan-22	15:49	45292.2	NA.8
21-Jan-22	15:00	46693.9	NA.8	21-Jan-22	15:55	45339.7	NA.0	21-Jan-22	15:50	45308.7	NA.8
21-Jan-22	15:01	46747.4	NA.8	21-Jan-22	15:56	45356.2	NA.0	21-Jan-22	15:51	45325.2	NA.8
21-Jan-22	15:02	46800.9	NA.8	21-Jan-22	15:57	45372.7	NA.0	21-Jan-22	15:52	45341.7	NA.8
21-Jan-22	15:03	46854.4	NA.8	21-Jan-22	15:58	45389.2	NA.0	21-Jan-22	15:53	45358.2	NA.8
21-Jan-22	15:04	46907.9	NA.8	21-Jan-22	15:59	45405.7	NA.0	21-Jan-22	15:54	45374.7	NA.8
21-Jan-22	15:05	46961.4	NA.8	21-Jan-22	16:00	45422.2	NA.0	21-Jan-22	15:55	45391.2	NA.8
21-Jan-22	15:06	47014.9	NA.8	21-Jan-22	16:01	45438.7	NA.0	21-Jan-22	15:56	45407.7	NA.8
21-Jan-22	15:07	47068.4	NA.8	21-Jan-22	16:02	45455.2	NA.0	21-Jan-22	15:57	45424.2	NA.8
21-Jan-22	15:08	47121.9	NA.8	21-Jan-22	16:03	45471.7	NA.0	21-Jan-22	15:58	45440.7	NA.8
21-Jan-22	15:09	47175.4	NA.8	21-Jan-22	16:04	45488.2	NA.0	21-Jan-22	15:59	45457.2	NA.8
21-Jan-22	15:10	47228.9	NA.8	21-Jan-22	16:05	45504.7	NA.0	21-Jan-22	16:00	45473.7	NA.8
21-Jan-22	15:11	47282.4	NA.8	21-Jan-22	16:06	45521.2	NA.0	21-Jan-22	16:01	45490.2	NA.8
21-Jan-22	15:12	47335.9	NA.8	21-Jan-22	16:07	45537.7	NA.0	21-Jan-22	16:02	45506.7	NA.8
21-Jan-22	15:13	47389.4	NA.8	21-Jan-22	16:08	45554.2	NA.0	21-Jan-22	16:03	45523.2	NA.8
21-Jan-22	15:14	47442.9	NA.8	21-Jan-22	16:09	45570.7	NA.0	21-Jan-22	16:04	45539.7	NA.8
21-Jan-22	15:15	47496.4	NA.8	21-Jan-22	16:10	45587.2	NA.0	21-Jan-22	16:05	45556.2	NA.8
21-Jan-22	15:16	47549.9	NA.8	21-Jan-22	16:11	45603.7	NA.0	21-Jan-22	16:06	45572.7	NA.8
21-Jan-22	15:17	47603.4	NA.8	21-Jan-22	16:12	45620.2	NA.0	21-Jan-22	16:07	45589.2	NA.8
21-Jan-22	15:18	47656.9	NA.8	21-Jan-22	16:13	45636.7	NA.0	21-Jan-22	16:08	45605.7	NA.8
21-Jan-22	15:19	47710.4	NA.8	21-Jan-22	16:14	45653.2	NA.0	21-Jan-22	16:09	45622.2	NA.8
21-Jan-22	15:20	47763.9	NA.8	21-Jan-22	16:15	45669.7	NA.0	21-Jan-22	16:10	45638.7	NA.8
21-Jan-22	15:21	47817.4	NA.8	21-Jan-22	16:16	45686.2	NA.0	21-Jan-22	16:11	45655.2	NA.8
21-Jan-22	15:22	47870.9	NA.8	21-Jan-22	16:17	45702.7	NA.0	21-Jan-22	16:12	45671.7	NA.8
21-Jan-22	15:23	47924.4	NA.8	21-Jan-22	16:18	45719.2	NA.0	21-Jan-22	16:13	45688.2	NA.8
21-Jan-22	15:24	47977.9	NA.8	21-Jan-22	16:19	45735.7	NA.0	21-Jan-22	16:14	45704.7	NA.8
21-Jan-22	15:25	48031.4	NA.8	21-Jan-22	16:20	45752.2	NA.0	21-Jan-22	16:15	45721.2	NA.8
21-Jan-22	15:26	48084.9	NA.8	21-Jan-22	16:21	45768.7	NA.0	21-Jan-22	16:16	45737.7	NA.8
21-Jan-22	15:27	48138.4	NA.8	21-Jan-22	16:22	45785.2	NA.0	21-Jan-22	16:17	45754.2	NA.8
21-Jan-22	15:28	48191.9	NA.8	21-Jan-22	16:23	45801.7	NA.0	21-Jan-22	16:18	45770.7	NA.8
21-Jan-22	15:29	48245.4	NA.8	21-Jan-22	16:24	45818.2	NA.0	21-Jan-22	16:19	45787.2	NA.8
21-Jan-22	15:30	48298.9	NA.8	21-Jan-22	16:25	45834.7	NA.0	21-Jan-22	16:20	45803.7	NA.8
21-Jan-22	15:31	48352.4	NA.8	21-Jan-22	16:26	45851.2	NA.0	21-Jan-22	16:21	45820.2	NA.8
21-Jan-22	15:32	48405.9	NA.8	21-Jan-22	16:27	45867.7	NA.0	21-Jan-22	16:22	45836.7	NA.8
21-Jan-22	15:33	48459.4	NA.8	21-Jan-22	16:28	45884.2	NA.0	21-Jan-22	16:23	45853.2	NA.8
21-Jan-22	15:34	48512.9	NA.8	21-Jan-22	16:29	45900.7	NA.0	21-Jan-22	16:24	45869.7	NA.8
21-Jan-22	15:35	48566.4	NA.8	21-Jan-22	16:30	45917.2	NA.0	21-Jan-22	16:25	45886.2	NA.8
21-Jan-22	15:36	48619.9	NA.8	21-Jan-22	16:31	45933.7	NA.0	21-Jan-22	16:26	45902.7	NA.8
21-Jan-22	15:37	48673.4	NA.8	21-Jan-22	16:32	45950.2	NA.0	21-Jan-22	16:27	45919.2	NA.8
21-Jan-22	15:38	48726.9	NA.8	21-Jan-22	16:33	45966.7	NA.0	21-Jan-22	16:28	45935.7	NA.8
21-Jan-22	15:39	48780.4	NA.8	21-Jan-22	16:34	45983.2	NA.0	21-Jan-22	16:29	45952.2	NA.8
21-Jan-22	15:40	48833.9	NA.8	21-Jan-22	16:35	45999.7	NA.0	21-Jan-22	16:30	45968.7	NA.8
21-Jan-22	15:41	48887.4	NA.8	21-Jan-22	16:36	46016.2	NA.0	21-Jan-22	16:31	45985.2	NA.8
21-Jan-22	15:42	48940.9	NA.8	21-Jan-22	16:37	46032.7	NA.0	21-Jan-22	16:32	46001.7	NA.8
21-Jan-22	15:43	48994.4	NA.8	21-Jan-22	16:38	46049.2	NA.0	21-Jan-22	16:33	46018.2	NA.8
21-Jan-22	15:44	49047.9	NA.8	21-Jan-22	16:39	46065.7	NA.0	21-Jan-22	16:34	46034.7	NA.8
21-Jan-22	15:45	49101.4	NA.8	21-Jan-22	16:40	46082.2	NA.0	21-Jan-22	16:35	46051.2	NA.8
21-Jan-22	15:46	49154.9	NA.8	21-Jan-22	16:41	46					



## CEMs Data

Client Name	Amata B. Grimm Power (Rayong) 3 Limited	Location	HRSG 31
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Run No. 9				Run No. 10				Run No. 11				Run No. 12			
Date	Time	Flowrate (m <sup>3</sup> /s)	Temperature (°C)	Date	Time	Flowrate (m <sup>3</sup> /s)	Temperature (°C)	Date	Time	Flowrate (m <sup>3</sup> /s)	Temperature (°C)	Date	Time	Flowrate (m <sup>3</sup> /s)	Temperature (°C)
24-Jun-02	10:00	40272.0	9.1	24-Jun-02	10:05	43904.6	8.9	24-Jun-02	11:00	48476.9	9.1	24-Jun-02	12:45	48200.0	9.1
24-Jun-02	10:01	42999.0	9.3	24-Jun-02	10:06	43901.6	8.8	24-Jun-02	11:01	48300.2	9.0	24-Jun-02	12:46	48300.0	9.2
24-Jun-02	10:02	43000.0	9.2	24-Jun-02	10:07	43902.6	8.9	24-Jun-02	11:02	48300.2	9.1	24-Jun-02	12:47	48300.0	9.1
24-Jun-02	10:03	43000.0	9.3	24-Jun-02	10:08	43903.6	8.9	24-Jun-02	11:03	48300.2	9.1	24-Jun-02	12:48	48300.0	9.1
24-Jun-02	10:04	43115.1	9.1	24-Jun-02	10:09	43904.6	8.9	24-Jun-02	11:04	48300.2	9.0	24-Jun-02	12:49	48300.0	9.1
24-Jun-02	10:05	43115.1	9.1	24-Jun-02	10:10	43905.6	8.9	24-Jun-02	11:05	48300.2	9.1	24-Jun-02	12:50	48300.0	9.2
24-Jun-02	10:06	43115.1	9.1	24-Jun-02	10:11	43906.6	8.9	24-Jun-02	11:06	48300.2	9.1	24-Jun-02	12:51	48300.0	9.2
24-Jun-02	10:07	43115.1	9.1	24-Jun-02	10:12	43907.6	8.9	24-Jun-02	11:07	48300.2	9.1	24-Jun-02	12:52	48300.0	9.2
24-Jun-02	10:08	43115.1	9.1	24-Jun-02	10:13	43908.6	8.9	24-Jun-02	11:08	48300.2	9.1	24-Jun-02	12:53	48300.0	9.2
24-Jun-02	10:09	43115.1	9.1	24-Jun-02	10:14	43909.6	8.9	24-Jun-02	11:09	48300.2	9.1	24-Jun-02	12:54	48300.0	9.2
24-Jun-02	10:10	43115.1	9.1	24-Jun-02	10:15	43910.6	8.9	24-Jun-02	11:10	48300.2	9.1	24-Jun-02	12:55	48300.0	9.2
24-Jun-02	10:11	43115.1	9.1	24-Jun-02	10:16	43911.6	8.9	24-Jun-02	11:11	48300.2	9.1	24-Jun-02	12:56	48300.0	9.2
24-Jun-02	10:12	43115.1	9.1	24-Jun-02	10:17	43912.6	8.9	24-Jun-02	11:12	48300.2	9.1	24-Jun-02	12:57	48300.0	9.2
24-Jun-02	10:13	43115.1	9.1	24-Jun-02	10:18	43913.6	8.9	24-Jun-02	11:13	48300.2	9.1	24-Jun-02	12:58	48300.0	9.2
24-Jun-02	10:14	43115.1	9.1	24-Jun-02	10:19	43914.6	8.9	24-Jun-02	11:14	48300.2	9.1	24-Jun-02	12:59	48300.0	9.2
24-Jun-02	10:15	43115.1	9.1	24-Jun-02	10:20	43915.6	8.9	24-Jun-02	11:15	48300.2	9.1	24-Jun-02	13:00	48300.0	9.2
24-Jun-02	10:16	43115.1	9.1	24-Jun-02	10:21	43916.6	8.9	24-Jun-02	11:16	48300.2	9.1	24-Jun-02	13:01	48300.0	9.2
24-Jun-02	10:17	43115.1	9.1	24-Jun-02	10:22	43917.6	8.9	24-Jun-02	11:17	48300.2	9.1	24-Jun-02	13:02	48300.0	9.2
24-Jun-02	10:18	43115.1	9.1	24-Jun-02	10:23	43918.6	8.9	24-Jun-02	11:18	48300.2	9.1	24-Jun-02	13:03	48300.0	9.2
24-Jun-02	10:19	43115.1	9.1	24-Jun-02	10:24	43919.6	8.9	24-Jun-02	11:19	48300.2	9.1	24-Jun-02	13:04	48300.0	9.2
24-Jun-02	10:20	43115.1	9.1	24-Jun-02	10:25	43920.6	8.9	24-Jun-02	11:20	48300.2	9.1	24-Jun-02	13:05	48300.0	9.2
24-Jun-02	10:21	43115.1	9.1	24-Jun-02	10:26	43921.6	8.9	24-Jun-02	11:21	48300.2	9.1	24-Jun-02	13:06	48300.0	9.2
24-Jun-02	10:22	43115.1	9.1	24-Jun-02	10:27	43922.6	8.9	24-Jun-02	11:22	48300.2	9.1	24-Jun-02	13:07	48300.0	9.2
24-Jun-02	10:23	43115.1	9.1	24-Jun-02	10:28	43923.6	8.9	24-Jun-02	11:23	48300.2	9.1	24-Jun-02	13:08	48300.0	9.2
24-Jun-02	10:24	43115.1	9.1	24-Jun-02	10:29	43924.6	8.9	24-Jun-02	11:24	48300.2	9.1	24-Jun-02	13:09	48300.0	9.2
24-Jun-02	10:25	43115.1	9.1	24-Jun-02	10:30	43925.6	8.9	24-Jun-02	11:25	48300.2	9.1	24-Jun-02	13:10	48300.0	9.2
24-Jun-02	10:26	43115.1	9.1	24-Jun-02	10:31	43926.6	8.9	24-Jun-02	11:26	48300.2	9.1	24-Jun-02	13:11	48300.0	9.2
24-Jun-02	10:27	43115.1	9.1	24-Jun-02	10:32	43927.6	8.9	24-Jun-02	11:27	48300.2	9.1	24-Jun-02	13:12	48300.0	9.2
24-Jun-02	10:28	43115.1	9.1	24-Jun-02	10:33	43928.6	8.9	24-Jun-02	11:28	48300.2	9.1	24-Jun-02	13:13	48300.0	9.2
24-Jun-02	10:29	43115.1	9.1	24-Jun-02	10:34	43929.6	8.9	24-Jun-02	11:29	48300.2	9.1	24-Jun-02	13:14	48300.0	9.2
24-Jun-02	10:30	43115.1	9.1	24-Jun-02	10:35	43930.6	8.9	24-Jun-02	11:30	48300.2	9.1	24-Jun-02	13:15	48300.0	9.2
24-Jun-02	10:31	43115.1	9.1	24-Jun-02	10:36	43931.6	8.9	24-Jun-02	11:31	48300.2	9.1	24-Jun-02	13:16	48300.0	9.2
24-Jun-02	10:32	43115.1	9.1	24-Jun-02	10:37	43932.6	8.9	24-Jun-02	11:32	48300.2	9.1	24-Jun-02	13:17	48300.0	9.2
24-Jun-02	10:33	43115.1	9.1	24-Jun-02	10:38	43933.6	8.9	24-Jun-02	11:33	48300.2	9.1	24-Jun-02	13:18	48300.0	9.2
24-Jun-02	10:34	43115.1	9.1	24-Jun-02	10:39	43934.6	8.9	24-Jun-02	11:34	48300.2	9.1	24-Jun-02	13:19	48300.0	9.2
24-Jun-02	10:35	43115.1	9.1	24-Jun-02	10:40	43935.6	8.9	24-Jun-02	11:35	48300.2	9.1	24-Jun-02	13:20	48300.0	9.2
24-Jun-02	10:36	43115.1	9.1	24-Jun-02	10:41	43936.6	8.9	24-Jun-02	11:36	48300.2	9.1	24-Jun-02	13:21	48300.0	9.2
24-Jun-02	10:37	43115.1	9.1	24-Jun-02	10:42	43937.6	8.9	24-Jun-02	11:37	48300.2	9.1	24-Jun-02	13:22	48300.0	9.2
24-Jun-02	10:38	43115.1	9.1	24-Jun-02	10:43	43938.6	8.9	24-Jun-02	11:38	48300.2	9.1	24-Jun-02	13:23	48300.0	9.2
24-Jun-02	10:39	43115.1	9.1	24-Jun-02	10:44	43939.6	8.9	24-Jun-02	11:39	48300.2	9.1	24-Jun-02	13:24	48300.0	9.2
24-Jun-02	10:40	43115.1	9.1	24-Jun-02	10:45	43940.6	8.9	24-Jun-02	11:40	48300.2	9.1	24-Jun-02	13:25	48300.0	9.2
24-Jun-02	10:41	43115.1	9.1	24-Jun-02	10:46	43941.6	8.9	24-Jun-02	11:41	48300.2	9.1	24-Jun-02	13:26	48300.0	9.2
24-Jun-02	10:42	43115.1	9.1	24-Jun-02	10:47	43942.6	8.9	24-Jun-02	11:42	48300.2	9.1	24-Jun-02	13:27	48300.0	9.2
24-Jun-02	10:43	43115.1	9.1	24-Jun-02	10:48	43943.6	8.9	24-Jun-02	11:43	48300.2	9.1	24-Jun-02	13:28	48300.0	9.2
24-Jun-02	10:44	43115.1	9.1	24-Jun-02	10:49	43944.6	8.9	24-Jun-02	11:44	48300.2	9.1	24-Jun-02	13:29	48300.0	9.2
24-Jun-02	10:45	43115.1	9.1	24-Jun-02	10:50	43945.6	8.9	24-Jun-02	11:45	48300.2	9.1	24-Jun-02	13:30	48300.0	9.2
24-Jun-02	10:46	43115.1	9.1	24-Jun-02	10:51	43946.6	8.9	24-Jun-02	11:46	48300.2	9.1	24-Jun-02	13:31	48300.0	9.2
24-Jun-02	10:47	43115.1	9.1	24-Jun-02	10:52	43947.6	8.9	24-Jun-02	11:47	48300.2	9.1	24-Jun-02	13:32	48300.0	9.2
24-Jun-02	10:48	43115.1	9.1	24-Jun-02	10:53	43948.6	8.9	24-Jun-02	11:48	48300.2	9.1	24-Jun-02	13:33	48300.0	9.2
24-Jun-02	10:49	43115.1	9.1	24-Jun-02	10:54	43949.6	8.9	24-Jun-02	11:49	48300.2	9.1	24-Jun-02	13:34	48300.0	9.2
24-Jun-02	10:50	43115.1	9.1	24-Jun-02	10:55	43950.6	8.9	24-Jun-02	11:50	48300.2	9.1	24-Jun-02	13:35	48300.0	9.2
24-Jun-02	10:51	43115.1	9.1	24-Jun-02	10:56	43951.6	8.9	24-Jun-02	11:51	48300.2	9.1	24-Jun-02	13:36	48300.0	9.2
24-Jun-02	10:52	43115.1	9.1	24-Jun-02	10:57	43952.6	8.9	24-Jun-02	11:52	48300.2	9.1	24-Jun-02	13:37	48300.0	9.2
24-Jun-02	10:53	43115.1	9.1	24-Jun-02	10:58	43953.6	8.9	24-Jun-02	11:53	48300.2	9.1	24-Jun-02	13:38	48300.0	9.2
24-Jun-02	10:54	43115.1	9.1	24-Jun-02	10:59	43954.6	8.9	24-Jun-02	11:54	48300.2	9.1	24-Jun-02	13:39	48300.0	9.2
24-Jun-02	10:55	43115.1	9.1	24-Jun-02	11:00	43955.6	8.9	24-Jun-02	11:55	48300.2	9.1	24-Jun-02	13:40	48300.0	9.2
24-Jun-02	10:56	43115.1	9.1	24-Jun-02	11:01	43956.6	8.9	24-Jun-02	11:56	48300.2	9.1	24-Jun-02	13:41	48300.0	9.2
24-Jun-02	10:57	43115.1	9.1	24-Jun-02	11:02	43957.6	8.9	24-Jun-02	11:57	48300.2	9.1	24-Jun-02	13:42	48300.0	9.2
24-Jun-02	10:58	43115.1	9.1	24-Jun-02	11:03	43958.6	8.9	24-Jun-02	11:58	48300.2	9.1	24-Jun-02	13:43	48300.0	9.2
24-Jun-02	10:59	43115.1	9.1	24-Jun-02	11:04	43959.6	8.9	24-Jun-02	11:59	48300.2	9.1	24-Jun-02	13:44	48300.0	9.2
24-Jun-02	11:00	43115.1	9.1	24-Jun-02	11:05	43960.6	8.9	24-Jun-02	12:00	48300.2	9.1	24-Jun-02	13:45	48300.0	9.2
24-Jun-02	11:01	43115.1	9.1	24-Jun-02	11:06	43961.6	8.9	24-Jun-02	12:01	48300.2	9.1	24-Jun-02	13:46	48300.0	9.2
24-Jun-02	11:02	43115.1	9.1	24-Jun-02	11:07	43962.6	8.9	24-Jun-02	12:02	48300.2	9.1	24-Jun-02	13:47	48300.0	9.2
24-Jun-02	11:03	43115.1	9.1	24-Jun-02	11:08	43963.6	8.9	24-Jun-02	12:03	48300.2	9.1	24-Jun-02	13:48	48300.0	9.2
24-Jun-02	11:04	43115.1	9.1	24-Jun-02	11:09	43964.6	8.9	24-Jun-02	12:04	48300.2	9.1	24-Jun-02	13:49	48300.0	9.2
24-Jun-02	11:05	43115.1	9.1	24-Jun-02	11:10	43965.6	8.9	24-Jun-02	12:05	48300.2	9.1	24-Jun-02	13:50	48300.0	9.2
24-Jun-02	11:06	43115.1	9.1	24-Jun-02	11:11	43966.6	8.9	24-Jun-02	12:06	48300.2	9.1	24-Jun-02	13:51	48300.0	9.2
24-Jun-02	11:07	43115.1	9.1	24-Jun-02	11:12	43967.6	8.9	24-Jun-02	12:07	48300.2	9.1	24-Jun-02	13:52	48300.0	9.2
24-Jun-02	11:08	43115.1	9.1	24-Jun-02	11:13	43968.6	8.9	24-Jun-02	12:08	48300.2	9.1	24-Jun-02	13:53	48300.0	9.2
24-Jun-02	11:09	43115.1	9.1	24-Jun-02	11:14	43969.6	8.9	24-Jun-02	12:09	48300.2	9.1	24-Jun-02	13:54	48300.0	9.2
24-Jun-02	11:10	43115.1	9.1	24-Jun-02	11:15	43970.6	8.9	24-Jun-02	12:10	48300.2	9.1	24-Jun-02	13:55	48300.0	9.2
24-Jun-02	11:11	43115.1	9.1	24-Jun-02	11:16	43971.6	8.9	24-Jun-02	12:11	48300.2	9.1	24-Jun-02	13:56	48300.0	9.2
24-Jun-02	11:12	43115.1	9.1	24-Jun-02	11:17	43972.6									



Lot No. 22117496-1

## ANALYZER CALIBRATION DATA

Client	:	<u>Amata B. Grimm Power (Rayong) 3 Limited</u>	Location	:	<u>HRSG 32</u>
Date	:	<u>22 Oct 22</u>	Test Operator	:	<u>Amurat M.</u>

O<sub>2</sub> ANALYZER  
Model : TELEDYNE API 200EH Serial No. : 648  
Span (%) : 25

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	0.04	0.10	0.24
Low-Level Gas	7.93	7.88	8.05	0.68
Span Gas	16.06	16.00	15.88	0.48

NO<sub>x</sub> ANALYZER

Model : TELEDYNE API 200EH Serial No. : 540

	Cylinder Value (ppm)	Initial Analyzers Calibration Responses (ppm)	Final Analyzers Calibration Responses (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.02	0.07	0.05
Low-Level Gas	50.32	50.11	49.78	0.33
Span Gas	79.86	79.77	79.25	0.53

802 ANALYZER

Model : TELEDYNE API 100EH Serial No. : 282

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	-0.02	0.02
Low-Level Gas	50.27	50.12	49.66	0.46
Span Gas	79.95	78.20	79.87	1.67

CO ANALYZER

Model : TELEDYNE API 300EM Serial No. : 300

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.04	0.02	0.02
Low-Level Gas	49.99	50.77	50.66	0.11
Span Gas	80.10	80.17	79.33	0.11

Calibrated by

Anwar M  
(Mr. Anwar Mounaqel)

Environmental Field Scientist (2)

FORM NO. F 06-104 REVISION NO. 11 ISSUE DATE 3/05/11

A.S. Laboratories, Inc.



Lot No. 22117496-1

## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client	: Amata B. Grimm Power (Rayong) 3 Limited	Location	: HRSG 32
Date	: 22 Oct 22	Test Operator	: Anusart M.

O<sub>2</sub> ANALYZER  
Cylinder Conc. (%) : 18.06      Span (%) : 25

	O <sub>2</sub> Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cell Bias (% of Span)	System Calibration Response	System Cell Bias (% of Span)	
Zero Gas	0.04	0.05	0.05	0.04	0.03	
Upscale Gas	16.00	15.87	0.52	15.78	0.36	

NO<sub>x</sub> ANALYZER

Cylinder Conc. (ppm) : 79.88 Span (ppm) : 100

	NO <sub>x</sub> Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.02	0.11	0.09	0.14	0.12	0.03
UpScale Gas	79.77	79.89	0.12	79.34	0.43	0.55

BO<sub>2</sub> ANALYZER

Cylinder Conc. (ppm) : 79.95 Span (ppm) : 100

	SO <sub>2</sub> Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	0.00	-0.10	0.10	-0.15	0.15	0.05
UpScale Gas	78.20	77.10	1.10	77.00	1.20	0.10

CO ANALYZER  
Cylinder Conn. (mm) : 80.10 : 100

Cylinder Conc. (ppm) : 80.10 Span (ppm) : 100

	CO Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cell Bias (% of Span)	System Calibration Response	System Cell Bias (% of Span)	
Zero Gas	0.04	0.11	0.07	0.08	0.04	0.03
Upscale Gas	80.17	79.67	0.50	79.77	0.40	0.10

Calibrated by

Answer 17

Environmental Field Scientist (2)

FORM NO. F-06-104 REVISION NO. ISSUE DATE 3/05/16

M. S. I. *Abstracts: Reviews*







### CEMs Data

Client Name Amata B. Grimm Power (Rayong) 3 Limited Location HRSG 32  
Plant Name ABPR 3

Run No. 1				Run No. 2				Run No. 3				Run No. 4			
Date	Time	Flowrate m <sup>3</sup> /hr	Temperature °C	Date	Time	Flowrate m <sup>3</sup> /hr	Temperature °C	Date	Time	Flowrate m <sup>3</sup> /hr	Temperature °C	Date	Time	Flowrate m <sup>3</sup> /hr	Temperature °C
20-02-92	15:50	44580.5	9.9	20-02-92	15:56	44581.5	9.8	20-02-92	15:50	43594.5	9.7	20-02-92	12:45	44777.1	9.9
20-02-92	15:51	44580.2	9.9	20-02-92	15:56	44582.2	9.8	20-02-92	15:51	43595.2	9.7	20-02-92	12:45	44777.1	9.9
20-02-92	15:52	44580.4	9.9	20-02-92	15:57	44585.5	9.7	20-02-92	15:52	43597.2	9.7	20-02-92	12:47	44768.2	9.8
20-02-92	15:53	44580.5	9.9	20-02-92	15:58	44586.0	9.7	20-02-92	15:53	43610.7	9.7	20-02-92	12:48	44768.2	9.8
20-02-92	15:54	44580.8	9.9	20-02-92	15:59	44586.5	9.7	20-02-92	15:54	43611.2	9.7	20-02-92	12:49	44768.2	9.8
20-02-92	15:55	44580.4	9.7	20-02-92	16:00	44583.3	9.8	20-02-92	15:55	43611.7	9.7	20-02-92	12:50	44768.2	9.8
20-02-92	15:56	44581.3	9.7	20-02-92	16:01	44583.8	9.8	20-02-92	15:56	43612.3	9.7	20-02-92	12:51	44768.2	9.8
20-02-92	15:57	44581.8	9.7	20-02-92	16:02	44584.3	9.8	20-02-92	15:57	43612.8	9.7	20-02-92	12:52	44768.2	9.8
20-02-92	15:58	44581.5	9.8	20-02-92	16:03	44585.3	9.8	20-02-92	15:58	43613.3	9.7	20-02-92	12:53	44768.2	9.8
20-02-92	15:59	44581.8	9.8	20-02-92	16:04	44585.5	9.8	20-02-92	15:59	43613.8	9.7	20-02-92	12:54	44768.2	9.8
20-02-92	16:00	44581.3	9.8	20-02-92	16:05	44586.0	9.8	20-02-92	16:00	43614.3	9.7	20-02-92	12:55	44768.2	9.8
20-02-92	16:01	44581.3	9.8	20-02-92	16:06	44586.5	9.8	20-02-92	16:01	43614.8	9.7	20-02-92	12:56	44768.2	9.8
20-02-92	16:02	44581.3	9.8	20-02-92	16:07	44587.0	9.8	20-02-92	16:02	43615.3	9.7	20-02-92	12:57	44768.2	9.8
20-02-92	16:03	44581.3	9.8	20-02-92	16:08	44587.5	9.8	20-02-92	16:03	43615.8	9.7	20-02-92	12:58	44768.2	9.8
20-02-92	16:04	44581.3	9.8	20-02-92	16:09	44588.0	9.8	20-02-92	16:04	43616.3	9.7	20-02-92	12:59	44768.2	9.8
20-02-92	16:05	44581.3	9.8	20-02-92	16:10	44588.5	9.8	20-02-92	16:05	43616.8	9.7	20-02-92	13:00	44768.2	9.8
20-02-92	16:06	44581.3	9.8	20-02-92	16:11	44589.0	9.8	20-02-92	16:06	43617.3	9.7	20-02-92	13:01	44768.2	9.8
20-02-92	16:07	44581.3	9.8	20-02-92	16:12	44589.5	9.8	20-02-92	16:07	43617.8	9.7	20-02-92	13:02	44768.2	9.8
20-02-92	16:08	44581.3	9.8	20-02-92	16:13	44590.0	9.8	20-02-92	16:08	43618.3	9.7	20-02-92	13:03	44768.2	9.8
20-02-92	16:09	44581.3	9.8	20-02-92	16:14	44590.5	9.8	20-02-92	16:09	43618.8	9.7	20-02-92	13:04	44768.2	9.8
20-02-92	16:10	44581.3	9.8	20-02-92	16:15	44591.0	9.8	20-02-92	16:10	43619.3	9.7	20-02-92	13:05	44768.2	9.8
20-02-92	16:11	44581.3	9.8	20-02-92	16:16	44591.5	9.8	20-02-92	16:11	43619.8	9.7	20-02-92	13:06	44768.2	9.8
20-02-92	16:12	44581.3	9.8	20-02-92	16:17	44592.0	9.8	20-02-92	16:12	43620.3	9.7	20-02-92	13:07	44768.2	9.8
20-02-92	16:13	44581.3	9.8	20-02-92	16:18	44592.5	9.8	20-02-92	16:13	43620.8	9.7	20-02-92	13:08	44768.2	9.8
20-02-92	16:14	44581.3	9.8	20-02-92	16:19	44593.0	9.8	20-02-92	16:14	43621.3	9.7	20-02-92	13:09	44768.2	9.8
20-02-92	16:15	44581.3	9.8	20-02-92	16:20	44593.5	9.8	20-02-92	16:15	43621.8	9.7	20-02-92	13:10	44768.2	9.8
20-02-92	16:16	44581.3	9.8	20-02-92	16:21	44594.0	9.8	20-02-92	16:16	43622.3	9.7	20-02-92	13:11	44768.2	9.8
20-02-92	16:17	44581.3	9.8	20-02-92	16:22	44594.5	9.8	20-02-92	16:17	43622.8	9.7	20-02-92	13:12	44768.2	9.8
20-02-92	16:18	44581.3	9.8	20-02-92	16:23	44595.0	9.8	20-02-92	16:18	43623.3	9.7	20-02-92	13:13	44768.2	9.8
20-02-92	16:19	44581.3	9.8	20-02-92	16:24	44595.5	9.8	20-02-92	16:19	43623.8	9.7	20-02-92	13:14	44768.2	9.8
20-02-92	16:20	44581.3	9.8	20-02-92	16:25	44596.0	9.8	20-02-92	16:20	43624.3	9.7	20-02-92	13:15	44768.2	9.8
20-02-92	16:21	44581.3	9.8	20-02-92	16:26	44596.5	9.8	20-02-92	16:21	43624.8	9.7	20-02-92	13:16	44768.2	9.8
20-02-92	16:22	44581.3	9.8	20-02-92	16:27	44597.0	9.8	20-02-92	16:22	43625.3	9.7	20-02-92	13:17	44768.2	9.8
20-02-92	16:23	44581.3	9.8	20-02-92	16:28	44597.5	9.8	20-02-92	16:23	43625.8	9.7	20-02-92	13:18	44768.2	9.8
20-02-92	16:24	44581.3	9.8	20-02-92	16:29	44598.0	9.8	20-02-92	16:24	43626.3	9.7	20-02-92	13:19	44768.2	9.8
20-02-92	16:25	44581.3	9.8	20-02-92	16:30	44598.5	9.8	20-02-92	16:25	43626.8	9.7	20-02-92	13:20	44768.2	9.8
20-02-92	16:26	44581.3	9.8	20-02-92	16:31	44599.0	9.8	20-02-92	16:26	43627.3	9.7	20-02-92	13:21	44768.2	9.8
20-02-92	16:27	44581.3	9.8	20-02-92	16:32	44599.5	9.8	20-02-92	16:27	43627.8	9.7	20-02-92	13:22	44768.2	9.8
20-02-92	16:28	44581.3	9.8	20-02-92	16:33	44600.0	9.8	20-02-92	16:28	43628.3	9.7	20-02-92	13:23	44768.2	9.8
20-02-92	16:29	44581.3	9.8	20-02-92	16:34	44600.5	9.8	20-02-92	16:29	43628.8	9.7	20-02-92	13:24	44768.2	9.8
20-02-92	16:30	44581.3	9.8	20-02-92	16:35	44601.0	9.8	20-02-92	16:30	43629.3	9.7	20-02-92	13:25	44768.2	9.8
20-02-92	16:31	44581.3	9.8	20-02-92	16:36	44601.5	9.8	20-02-92	16:31	43629.8	9.7	20-02-92	13:26	44768.2	9.8
20-02-92	16:32	44581.3	9.8	20-02-92	16:37	44602.0	9.8	20-02-92	16:32	43630.3	9.7	20-02-92	13:27	44768.2	9.8
20-02-92	16:33	44581.3	9.8	20-02-92	16:38	44602.5	9.8	20-02-92	16:33	43630.8	9.7	20-02-92	13:28	44768.2	9.8
20-02-92	16:34	44581.3	9.8	20-02-92	16:39	44603.0	9.8	20-02-92	16:34	43631.3	9.7	20-02-92	13:29	44768.2	9.8
20-02-92	16:35	44581.3	9.8	20-02-92	16:40	44603.5	9.8	20-02-92	16:35	43631.8	9.7	20-02-92	13:30	44768.2	9.8
20-02-92	16:36	44581.3	9.8	20-02-92	16:41	44604.0	9.8	20-02-92	16:36	43632.3	9.7	20-02-92	13:31	44768.2	9.8
20-02-92	16:37	44581.3	9.8	20-02-92	16:42	44604.5	9.8	20-02-92	16:37	43632.8	9.7	20-02-92	13:32	44768.2	9.8
20-02-92	16:38	44581.3	9.8	20-02-92	16:43	44605.0	9.8	20-02-92	16:38	43633.3	9.7	20-02-92	13:33	44768.2	9.8
20-02-92	16:39	44581.3	9.8	20-02-92	16:44	44605.5	9.8	20-02-92	16:39	43633.8	9.7	20-02-92	13:34	44768.2	9.8
20-02-92	16:40	44581.3	9.8	20-02-92	16:45	44606.0	9.8	20-02-92	16:40	43634.3	9.7	20-02-92	13:35	44768.2	9.8
20-02-92	16:41	44581.3	9.8	20-02-92	16:46	44606.5	9.8	20-02-92	16:41	43634.8	9.7	20-02-92	13:36	44768.2	9.8
20-02-92	16:42	44581.3	9.8	20-02-92	16:47	44607.0	9.8	20-02-92	16:42	43635.3	9.7	20-02-92	13:37	44768.2	9.8
20-02-92	16:43	44581.3	9.8	20-02-92	16:48	44607.5	9.8	20-02-92	16:43	43635.8	9.7	20-02-92	13:38	44768.2	9.8
20-02-92	16:44	44581.3	9.8	20-02-92	16:49	44608.0	9.8	20-02-92	16:44	43636.3	9.7	20-02-92	13:39	44768.2	9.8
20-02-92	16:45	44581.3	9.8	20-02-92	16:50	44608.5	9.8	20-02-92	16:45	43636.8	9.7	20-02-92	13:40	44768.2	9.8
20-02-92	16:46	44581.3	9.8	20-02-92	16:51	44609.0	9.8	20-02-92	16:46	43637.3	9.7	20-02-92	13:41	44768.2	9.8
20-02-92	16:47	44581.3	9.8	20-02-92	16:52	44609.5	9.8	20-02-92	16:47	43637.8	9.7	20-02-92	13:42	44768.2	9.8
20-02-92	16:48	44581.3	9.8	20-02-92	16:53	44610.0	9.8	20-02-92	16:48	43638.3	9.7	20-02-92	13:43	44768.2	9.8
20-02-92	16:49	44581.3	9.8	20-02-92	16:54	44610.5	9.8	20-02-92	16:49	43638.8	9.7	20-02-92	13:44	44768.2	9.8
20-02-92	16:50	44581.3	9.8	20-02-92	16:55	44611.0	9.8	20-02-92	16:50	43639.3	9.7	20-02-92	13:45	44768.2	9.8
20-02-92	16:51	44581.3	9.8	20-02-92	16:56	44611.5	9.8	20-02-92	16:51	43639.8	9.7	20-02-92	13:46	44768.2	9.8
20-02-92	16:52	44581.3	9.8	20-02-92	16:57	44612.0	9.8	20-02-92	16:52	43640.3	9.7	20-02-92	13:47	44768.2	9.8
20-02-92	16:53	44581.3	9.8	20-02-92	16:58	44612.5	9.8	20-02-92	16:53	43640.8	9.7	20-02-92	13:48	44768.2	9.8
20-02-92	16:54	44581.3	9.8	20-02-92	16:59	44613.0	9.8	20-02-92	16:54	43641.3	9.7	20-02-92	13:49	44768.2	9.8
20-02-92	16:55	44581.3	9.8	20-02-92	17:00	44613.5	9.8	20-02-92	16:55	43641.8	9.7	20-02-92	13:50	44768.2	9.8
20-02-92	16:56	44581.3	9.8	20-02-92	17:01	44614.0	9.8	20-02-92	16:56	43642.3	9.7	20-02-92	13:51	44768.2	9.8
20-02-92	16:57	44581.3	9.8	20-02-92	17:02	44614.5	9.8	20-02-92	16:57	43642.8	9.7	20-02-92	13:52	44768.2	9.8
20-02-92	16:58	44581.3	9.8	20-02-92	17:03	44615.0	9.8	20-02-92	16:58	43643.3	9.7	20-02-92	13:53	44768.2	9.8
20-02-92	16:59														



### CEMs Data

Client Name Amata b. Grimm Power (Rayong) 3 Limited Location HRSG 32  
Plant Name ABPR 3

Run No. 5				Run No. 6				Run No. 7				Run No. 8			
Date	Time	Fluxes	Temperature	Date	Time	Fluxes	Temperature	Date	Time	Fluxes	Temperature	Date	Time	Fluxes	Temperature
25-02-02	13:40	4494543	94.2	25-02-02	13:35	4494364	94.5	25-02-02	15:09	4497102	94.8	25-02-02	15:07	4497115	94.8
25-02-02	13:41	4494578	94.8	25-02-02	13:36	4494395	94.5	25-02-02	15:11	4497084	94.8	25-02-02	15:11	4497134	95.4
25-02-02	13:42	4494592	94.2	25-02-02	13:37	4494422	94.2	25-02-02	15:12	4497065	94.8	25-02-02	15:12	4497154	95.4
25-02-02	13:43	4494573	94.1	25-02-02	13:38	4494451	94.2	25-02-02	15:13	4497046	94.8	25-02-02	15:13	4497174	95.4
25-02-02	13:44	4494545	94.1	25-02-02	13:39	4494481	94.8	25-02-02	15:14	4497027	94.1	25-02-02	15:14	4497194	95.4
25-02-02	13:45	4494515	94.4	25-02-02	13:40	4494511	94.5	25-02-02	15:15	4497008	94.8	25-02-02	15:15	4497214	95.7
25-02-02	13:46	4494477	94.2	25-02-02	13:41	4494547	94.7	25-02-02	15:16	4496989	94.8	25-02-02	15:16	4497234	95.7
25-02-02	13:47	4494438	94.8	25-02-02	13:42	4494582	94.1	25-02-02	15:17	4496970	94.1	25-02-02	15:17	4497254	95.7
25-02-02	13:48	4494398	94.4	25-02-02	13:43	4494619	94.1	25-02-02	15:18	4496951	94.8	25-02-02	15:18	4497274	95.7
25-02-02	13:49	4494357	94.4	25-02-02	13:44	4494658	94.8	25-02-02	15:19	4496932	94.8	25-02-02	15:19	4497294	95.7
25-02-02	13:50	4494315	94.7	25-02-02	13:45	4494697	94.8	25-02-02	15:20	4496913	94.8	25-02-02	15:20	4497314	95.7
25-02-02	13:51	4494273	94.7	25-02-02	13:46	4494737	94.1	25-02-02	15:21	4496894	94.8	25-02-02	15:21	4497334	95.7
25-02-02	13:52	4494231	94.4	25-02-02	13:47	4494778	94.8	25-02-02	15:22	4496875	94.8	25-02-02	15:22	4497354	95.7
25-02-02	13:53	4494189	94.1	25-02-02	13:48	4494819	94.8	25-02-02	15:23	4496856	94.8	25-02-02	15:23	4497374	95.7
25-02-02	13:54	4494147	94.8	25-02-02	13:49	4494860	94.1	25-02-02	15:24	4496837	94.8	25-02-02	15:24	4497394	95.7
25-02-02	13:55	4494105	94.8	25-02-02	13:50	4494901	94.8	25-02-02	15:25	4496818	94.8	25-02-02	15:25	4497414	95.7
25-02-02	13:56	4494063	94.8	25-02-02	13:51	4494942	94.8	25-02-02	15:26	4496799	94.8	25-02-02	15:26	4497434	95.7
25-02-02	13:57	4494021	94.7	25-02-02	13:52	4494983	94.8	25-02-02	15:27	4496780	94.8	25-02-02	15:27	4497454	95.7
25-02-02	13:58	4493979	94.7	25-02-02	13:53	4495024	94.8	25-02-02	15:28	4496761	94.8	25-02-02	15:28	4497474	95.7
25-02-02	13:59	4493937	94.7	25-02-02	13:54	4495065	94.8	25-02-02	15:29	4496742	94.8	25-02-02	15:29	4497494	95.7
25-02-02	14:00	4493895	94.7	25-02-02	13:55	4495106	94.8	25-02-02	15:30	4496723	94.8	25-02-02	15:30	4497514	95.7
25-02-02	14:01	4493853	94.7	25-02-02	13:56	4495147	94.8	25-02-02	15:31	4496704	94.8	25-02-02	15:31	4497534	95.7
25-02-02	14:02	4493811	94.7	25-02-02	13:57	4495188	94.8	25-02-02	15:32	4496685	94.8	25-02-02	15:32	4497554	95.7
25-02-02	14:03	4493769	94.7	25-02-02	13:58	4495229	94.8	25-02-02	15:33	4496666	94.8	25-02-02	15:33	4497574	95.7
25-02-02	14:04	4493727	94.7	25-02-02	13:59	4495270	94.8	25-02-02	15:34	4496647	94.8	25-02-02	15:34	4497594	95.7
25-02-02	14:05	4493685	94.7	25-02-02	14:00	4495311	94.8	25-02-02	15:35	4496628	94.8	25-02-02	15:35	4497614	95.7
25-02-02	14:06	4493643	94.7	25-02-02	14:01	4495352	94.8	25-02-02	15:36	4496609	94.8	25-02-02	15:36	4497634	95.7
25-02-02	14:07	4493601	94.7	25-02-02	14:02	4495393	94.8	25-02-02	15:37	4496590	94.8	25-02-02	15:37	4497654	95.7
25-02-02	14:08	4493559	94.7	25-02-02	14:03	4495434	94.8	25-02-02	15:38	4496571	94.8	25-02-02	15:38	4497674	95.7
25-02-02	14:09	4493517	94.7	25-02-02	14:04	4495475	94.8	25-02-02	15:39	4496552	94.8	25-02-02	15:39	4497694	95.7
25-02-02	14:10	4493475	94.7	25-02-02	14:05	4495516	94.8	25-02-02	15:40	4496533	94.8	25-02-02	15:40	4497714	95.7
25-02-02	14:11	4493433	94.7	25-02-02	14:06	4495557	94.8	25-02-02	15:41	4496514	94.8	25-02-02	15:41	4497734	95.7
25-02-02	14:12	4493391	94.7	25-02-02	14:07	4495598	94.8	25-02-02	15:42	4496495	94.8	25-02-02	15:42	4497754	95.7
25-02-02	14:13	4493349	94.7	25-02-02	14:08	4495639	94.8	25-02-02	15:43	4496476	94.8	25-02-02	15:43	4497774	95.7
25-02-02	14:14	4493307	94.8	25-02-02	14:09	4495680	94.8	25-02-02	15:44	4496457	94.8	25-02-02	15:44	4497794	95.7
25-02-02	14:15	4493265	94.8	25-02-02	14:10	4495721	94.8	25-02-02	15:45	4496438	94.8	25-02-02	15:45	4497814	95.7
25-02-02	14:16	4493223	94.8	25-02-02	14:11	4495762	94.8	25-02-02	15:46	4496419	94.8	25-02-02	15:46	4497834	95.7
25-02-02	14:17	4493181	94.8	25-02-02	14:12	4495803	94.8	25-02-02	15:47	4496400	94.8	25-02-02	15:47	4497854	95.7
25-02-02	14:18	4493139	94.8	25-02-02	14:13	4495844	94.8	25-02-02	15:48	4496381	94.8	25-02-02	15:48	4497874	95.7
25-02-02	14:19	4493097	94.7	25-02-02	14:14	4495885	94.8	25-02-02	15:49	4496362	94.8	25-02-02	15:49	4497894	95.7
25-02-02	14:20	4493055	94.7	25-02-02	14:15	4495926	94.8	25-02-02	15:50	4496343	94.8	25-02-02	15:50	4497914	95.7
25-02-02	14:21	4493013	94.7	25-02-02	14:16	4495967	94.8	25-02-02	15:51	4496324	94.8	25-02-02	15:51	4497934	95.7
25-02-02	14:22	4492971	94.7	25-02-02	14:17	4496008	94.8	25-02-02	15:52	4496305	94.8	25-02-02	15:52	4497954	95.7
25-02-02	14:23	4492929	94.7	25-02-02	14:18	4496049	94.8	25-02-02	15:53	4496286	94.8	25-02-02	15:53	4497974	95.7
25-02-02	14:24	4492887	94.7	25-02-02	14:19	4496090	94.8	25-02-02	15:54	4496267	94.8	25-02-02	15:54	4497994	95.7
25-02-02	14:25	4492845	94.7	25-02-02	14:20	4496131	94.8	25-02-02	15:55	4496248	94.8	25-02-02	15:55	4498014	95.7
25-02-02	14:26	4492803	94.7	25-02-02	14:21	4496172	94.8	25-02-02	15:56	4496229	94.8	25-02-02	15:56	4498034	95.7
25-02-02	14:27	4492761	94.7	25-02-02	14:22	4496213	94.8	25-02-02	15:57	4496210	94.8	25-02-02	15:57	4498054	95.7
25-02-02	14:28	4492719	94.7	25-02-02	14:23	4496254	94.8	25-02-02	15:58	4496191	94.8	25-02-02	15:58	4498074	95.7
25-02-02	14:29	4492677	94.7	25-02-02	14:24	4496295	94.8	25-02-02	15:59	4496172	94.8	25-02-02	15:59	4498094	95.7
25-02-02	14:30	4492635	94.7	25-02-02	14:25	4496336	94.8	25-02-02	16:00	4496153	94.8	25-02-02	16:00	4498114	95.7
25-02-02	14:31	4492593	94.7	25-02-02	14:26	4496377	94.8	25-02-02	16:01	4496134	94.8	25-02-02	16:01	4498134	95.7
25-02-02	14:32	4492551	94.7	25-02-02	14:27	4496418	94.8	25-02-02	16:02	4496115	94.8	25-02-02	16:02	4498154	95.7
25-02-02	14:33	4492509	94.7	25-02-02	14:28	4496459	94.8	25-02-02	16:03	4496096	94.8	25-02-02	16:03	4498174	95.7
25-02-02	14:34	4492467	94.7	25-02-02	14:29	4496500	94.8	25-02-02	16:04	4496077	94.8	25-02-02	16:04	4498194	95.7
25-02-02	14:35	4492425	94.7	25-02-02	14:30	4496541	94.8	25-02-02	16:05	4496058	94.8	25-02-02	16:05	4498214	95.7
25-02-02	14:36	4492383	94.7	25-02-02	14:31	4496582	94.8	25-02-02	16:06	4496039	94.8	25-02-02	16:06	4498234	95.7
25-02-02	14:37	4492341	94.7	25-02-02	14:32	4496623	94.8	25-02-02	16:07	4496020	94.8	25-02-02	16:07	4498254	95.7
25-02-02	14:38	4492299	94.7	25-02-02	14:33	4496664	94.8	25-02-02	16:08	4496001	94.8	25-02-02	16:08	4498274	95.7
25-02-02	14:39	4492257	94.7	25-02-02	14:34	4496705	94.8	25-02-02	16:09	4495982	94.8	25-02-02	16:09	4498294	95.7
25-02-02	14:40	4492215	94.7	25-02-02	14:35	4496746	94.8	25-02-02	16:10	4495963	94.8	25-02-02	16:10	4498314	95.7
25-02-02	14:41	4492173	94.7	25-02-02	14:36	4496787	94.8	25-02-02	16:11	4495944	94.8	25-02-02	16:11	4498334	95.7
25-02-02	14:42	4492131	94.7	25-02-02	14:37	4496828	94.8	25-02-02	16:12	4495925	94.8	25-02-02	16:12	4498354	95.7
25-02-02	14:43	4492089	94.7	25-02-02	14:38	4496869	94.8	25-02-02	16:13	4495906	94.8	25-02-02	16:13	4498374	95.7
25-02-02	14:44	4492047	94.7	25-02-02	14:39	4496910	94.8	25-02-02	16:14	4495887	94.8	25-02-02	16:14	4498394	95.7
25-02-02	14:45	4492005	94.7	25-02-02	14:40	4496951	94.8	25-02-02	16:15	4495868	94.8	25-02-02	16:15	4498414	95.7
25-02-02	14:46	4491963	94.7	25-02-02	14:41	4496992	94.8	25-02-02	16:16	4495849	94.8	25-02-02	16:16	4498434	95.7
25-02-02	14:47	4491921	94.7	25-02-02	14:42	4497033	94.8	25-02-02	16:17	4495830	94.8	25-02-02	16:17	449	



### CEMs Data

Client Name Amata B. Grimm Power (Rayong) 3 Limited Location HRSG 32  
Plant Name ABPR3

Run No. 9				Run No. 10				Run No. 11				Run No. 12			
Date	Time	Flowrate m <sup>3</sup> /hr	Temperature °C	Date	Time	Flowrate m <sup>3</sup> /hr	Temperature °C	Date	Time	Flowrate m <sup>3</sup> /hr	Temperature °C	Date	Time	Flowrate m <sup>3</sup> /hr	Temperature °C
23-Jan-12	15:50	478989.1	9.2	23-Jan-12	11:50	478738.5	9.1	23-Jan-12	12:45	478976.8	9.1	23-Jan-12	13:40	478973.2	9.1
23-Jan-12	15:52	478991.4	9.2	23-Jan-12	11:52	478950.5	9.1	23-Jan-12	12:46	478982.2	9.1	23-Jan-12	13:42	478973.2	9.1
23-Jan-12	15:53	478993.7	9.1	23-Jan-12	11:53	478952.8	9.1	23-Jan-12	12:47	478987.6	9.1	23-Jan-12	13:44	478973.2	9.1
23-Jan-12	15:54	478996.0	9.1	23-Jan-12	11:54	478955.1	9.1	23-Jan-12	12:48	478993.0	9.1	23-Jan-12	13:46	478973.2	9.1
23-Jan-12	15:55	478998.3	9.1	23-Jan-12	11:55	478957.4	9.1	23-Jan-12	12:49	478998.4	9.1	23-Jan-12	13:48	478973.2	9.1
23-Jan-12	15:56	478999.6	9.1	23-Jan-12	11:56	478959.7	9.1	23-Jan-12	12:50	479003.8	9.1	23-Jan-12	13:50	478973.2	9.1
23-Jan-12	15:57	479001.9	9.1	23-Jan-12	11:57	478962.0	9.1	23-Jan-12	12:51	479009.2	9.1	23-Jan-12	13:52	478973.2	9.1
23-Jan-12	15:58	479004.2	9.1	23-Jan-12	11:58	478964.3	9.1	23-Jan-12	12:52	479014.6	9.1	23-Jan-12	13:54	478973.2	9.1
23-Jan-12	15:59	479006.5	9.1	23-Jan-12	11:59	478966.6	9.1	23-Jan-12	12:53	479020.0	9.1	23-Jan-12	13:56	478973.2	9.1
23-Jan-12	16:00	479008.8	9.1	23-Jan-12	12:00	478968.9	9.1	23-Jan-12	12:54	479025.4	9.1	23-Jan-12	13:58	478973.2	9.1
23-Jan-12	16:01	479011.1	9.1	23-Jan-12	12:01	478971.2	9.1	23-Jan-12	12:55	479030.8	9.1	23-Jan-12	14:00	478973.2	9.1
23-Jan-12	16:02	479013.4	9.1	23-Jan-12	12:02	478973.5	9.1	23-Jan-12	12:56	479036.2	9.1	23-Jan-12	14:02	478973.2	9.1
23-Jan-12	16:03	479015.7	9.1	23-Jan-12	12:03	478975.8	9.1	23-Jan-12	12:57	479041.6	9.1	23-Jan-12	14:04	478973.2	9.1
23-Jan-12	16:04	479018.0	9.1	23-Jan-12	12:04	478978.1	9.1	23-Jan-12	12:58	479047.0	9.1	23-Jan-12	14:06	478973.2	9.1
23-Jan-12	16:05	479020.3	9.1	23-Jan-12	12:05	478980.4	9.1	23-Jan-12	12:59	479052.4	9.1	23-Jan-12	14:08	478973.2	9.1
23-Jan-12	16:06	479022.6	9.1	23-Jan-12	12:06	478982.7	9.1	23-Jan-12	13:00	479057.8	9.1	23-Jan-12	14:10	478973.2	9.1
23-Jan-12	16:07	479024.9	9.1	23-Jan-12	12:07	478985.0	9.1	23-Jan-12	13:01	479063.2	9.1	23-Jan-12	14:12	478973.2	9.1
23-Jan-12	16:08	479027.2	9.1	23-Jan-12	12:08	478987.3	9.1	23-Jan-12	13:02	479068.6	9.1	23-Jan-12	14:14	478973.2	9.1
23-Jan-12	16:09	479029.5	9.1	23-Jan-12	12:09	478989.6	9.1	23-Jan-12	13:03	479074.0	9.1	23-Jan-12	14:16	478973.2	9.1
23-Jan-12	16:10	479031.8	9.1	23-Jan-12	12:10	478991.9	9.1	23-Jan-12	13:04	479079.4	9.1	23-Jan-12	14:18	478973.2	9.1
23-Jan-12	16:11	479034.1	9.1	23-Jan-12	12:11	478994.2	9.1	23-Jan-12	13:05	479084.8	9.1	23-Jan-12	14:20	478973.2	9.1
23-Jan-12	16:12	479036.4	9.1	23-Jan-12	12:12	478996.5	9.1	23-Jan-12	13:06	479090.2	9.1	23-Jan-12	14:22	478973.2	9.1
23-Jan-12	16:13	479038.7	9.1	23-Jan-12	12:13	478998.8	9.1	23-Jan-12	13:07	479095.6	9.1	23-Jan-12	14:24	478973.2	9.1
23-Jan-12	16:14	479041.0	9.1	23-Jan-12	12:14	479001.1	9.1	23-Jan-12	13:08	479101.0	9.1	23-Jan-12	14:26	478973.2	9.1
23-Jan-12	16:15	479043.3	9.1	23-Jan-12	12:15	479003.4	9.1	23-Jan-12	13:09	479106.4	9.1	23-Jan-12	14:28	478973.2	9.1
23-Jan-12	16:16	479045.6	9.1	23-Jan-12	12:16	479005.7	9.1	23-Jan-12	13:10	479111.8	9.1	23-Jan-12	14:30	478973.2	9.1
23-Jan-12	16:17	479047.9	9.1	23-Jan-12	12:17	479008.0	9.1	23-Jan-12	13:11	479117.2	9.1	23-Jan-12	14:32	478973.2	9.1
23-Jan-12	16:18	479050.2	9.1	23-Jan-12	12:18	479010.3	9.1	23-Jan-12	13:12	479122.6	9.1	23-Jan-12	14:34	478973.2	9.1
23-Jan-12	16:19	479052.5	9.1	23-Jan-12	12:19	479012.6	9.1	23-Jan-12	13:13	479128.0	9.1	23-Jan-12	14:36	478973.2	9.1
23-Jan-12	16:20	479054.8	9.1	23-Jan-12	12:20	479014.9	9.1	23-Jan-12	13:14	479133.4	9.1	23-Jan-12	14:38	478973.2	9.1
23-Jan-12	16:21	479057.1	9.1	23-Jan-12	12:21	479017.2	9.1	23-Jan-12	13:15	479138.8	9.1	23-Jan-12	14:40	478973.2	9.1
23-Jan-12	16:22	479059.4	9.1	23-Jan-12	12:22	479019.5	9.1	23-Jan-12	13:16	479144.2	9.1	23-Jan-12	14:42	478973.2	9.1
23-Jan-12	16:23	479061.7	9.1	23-Jan-12	12:23	479021.8	9.1	23-Jan-12	13:17	479149.6	9.1	23-Jan-12	14:44	478973.2	9.1
23-Jan-12	16:24	479064.0	9.1	23-Jan-12	12:24	479024.1	9.1	23-Jan-12	13:18	479155.0	9.1	23-Jan-12	14:46	478973.2	9.1
23-Jan-12	16:25	479066.3	9.1	23-Jan-12	12:25	479026.4	9.1	23-Jan-12	13:19	479160.4	9.1	23-Jan-12	14:48	478973.2	9.1
23-Jan-12	16:26	479068.6	9.1	23-Jan-12	12:26	479028.7	9.1	23-Jan-12	13:20	479165.8	9.1	23-Jan-12	14:50	478973.2	9.1
23-Jan-12	16:27	479070.9	9.1	23-Jan-12	12:27	479031.0	9.1	23-Jan-12	13:21	479171.2	9.1	23-Jan-12	14:52	478973.2	9.1
23-Jan-12	16:28	479073.2	9.1	23-Jan-12	12:28	479033.3	9.1	23-Jan-12	13:22	479176.6	9.1	23-Jan-12	14:54	478973.2	9.1
23-Jan-12	16:29	479075.5	9.1	23-Jan-12	12:29	479035.6	9.1	23-Jan-12	13:23	479182.0	9.1	23-Jan-12	14:56	478973.2	9.1
23-Jan-12	16:30	479077.8	9.1	23-Jan-12	12:30	479037.9	9.1	23-Jan-12	13:24	479187.4	9.1	23-Jan-12	14:58	478973.2	9.1
23-Jan-12	16:31	479080.1	9.1	23-Jan-12	12:31	479040.2	9.1	23-Jan-12	13:25	479192.8	9.1	23-Jan-12	15:00	478973.2	9.1
23-Jan-12	16:32	479082.4	9.1	23-Jan-12	12:32	479042.5	9.1	23-Jan-12	13:26	479198.2	9.1	23-Jan-12	15:02	478973.2	9.1
23-Jan-12	16:33	479084.7	9.1	23-Jan-12	12:33	479044.8	9.1	23-Jan-12	13:27	479203.6	9.1	23-Jan-12	15:04	478973.2	9.1
23-Jan-12	16:34	479087.0	9.1	23-Jan-12	12:34	479047.1	9.1	23-Jan-12	13:28	479209.0	9.1	23-Jan-12	15:06	478973.2	9.1
23-Jan-12	16:35	479089.3	9.1	23-Jan-12	12:35	479049.4	9.1	23-Jan-12	13:29	479214.4	9.1	23-Jan-12	15:08	478973.2	9.1
23-Jan-12	16:36	479091.6	9.1	23-Jan-12	12:36	479051.7	9.1	23-Jan-12	13:30	479219.8	9.1	23-Jan-12	15:10	478973.2	9.1
23-Jan-12	16:37	479093.9	9.1	23-Jan-12	12:37	479054.0	9.1	23-Jan-12	13:31	479225.2	9.1	23-Jan-12	15:12	478973.2	9.1
23-Jan-12	16:38	479096.2	9.1	23-Jan-12	12:38	479056.3	9.1	23-Jan-12	13:32	479230.6	9.1	23-Jan-12	15:14	478973.2	9.1
23-Jan-12	16:39	479098.5	9.1	23-Jan-12	12:39	479058.6	9.1	23-Jan-12	13:33	479236.0	9.1	23-Jan-12	15:16	478973.2	9.1
23-Jan-12	16:40	479100.8	9.1	23-Jan-12	12:40	479060.9	9.1	23-Jan-12	13:34	479241.4	9.1	23-Jan-12	15:18	478973.2	9.1
23-Jan-12	16:41	479103.1	9.1	23-Jan-12	12:41	479063.2	9.1	23-Jan-12	13:35	479246.8	9.1	23-Jan-12	15:20	478973.2	9.1
23-Jan-12	16:42	479105.4	9.1	23-Jan-12	12:42	479065.5	9.1	23-Jan-12	13:36	479252.2	9.1	23-Jan-12	15:22	478973.2	9.1
23-Jan-12	16:43	479107.7	9.1	23-Jan-12	12:43	479067.8	9.1	23-Jan-12	13:37	479257.6	9.1	23-Jan-12	15:24	478973.2	9.1
23-Jan-12	16:44	479110.0	9.1	23-Jan-12	12:44	479070.1	9.1	23-Jan-12	13:38	479263.0	9.1	23-Jan-12	15:26	478973.2	9.1
23-Jan-12	16:45	479112.3	9.1	23-Jan-12	12:45	479072.4	9.1	23-Jan-12	13:39	479268.4	9.1	23-Jan-12	15:28	478973.2	9.1
23-Jan-12	16:46	479114.6	9.1	23-Jan-12	12:46	479074.7	9.1	23-Jan-12	13:40	479273.8	9.1	23-Jan-12	15:30	478973.2	9.1
23-Jan-12	16:47	479116.9	9.1	23-Jan-12	12:47	479077.0	9.1	23-Jan-12	13:41	479279.2	9.1	23-Jan-12	15:32	478973.2	9.1
23-Jan-12	16:48	479119.2	9.1	23-Jan-12	12:48	479079.3	9.1	23-Jan-12	13:42	479284.6	9.1	23-Jan-12	15:34	478973.2	9.1
23-Jan-12	16:49	479121.5	9.1	23-Jan-12	12:49	479081.6	9.1	23-Jan-12	13:43	479290.0	9.1	23-Jan-12	15:36	478973.2	9.1
23-Jan-12	16:50	479123.8	9.1	23-Jan-12	12:50	479083.9	9.1	23-Jan-12	13:44	479295.4	9.1	23-Jan-12	15:38	478973.2	9.1
23-Jan-12	16:51	479126.1	9.1	23-Jan-12	12:51	479086.2	9.1	23-Jan-12	13:45	479300.8	9.1	23-Jan-12	15:40	478973.2	9.1
23-Jan-12	16:52	479128.4	9.1	23-Jan-12	12:52	479088.5	9.1	23-Jan-12	13:46	479306.2	9.1	23-Jan-12	15:42	478973.2	9.1
23-Jan-12	16:53	479130.7	9.1	23-Jan-12	12:53	479090.8	9.1	23-Jan-12	13:47	479311.6	9.1	23-Jan-12	15:44	478973.2	9.1
23-Jan-12	16:54	479133.0	9.1	23-Jan-12	12:54	479093.1	9.1	23-Jan-12	13:48	479317.0	9.1	23-Jan-12	15:46	478973.2	9.1
23-Jan-12	16:55	479135.3	9.1	23-Jan-12	12:55	479095.4	9.1	23-Jan-12	13:49	479322.4	9.1	23-Jan-12	15:48	478973.2	9.1
23-Jan-12	16:56	479137.6	9.1	23-Jan-12	12:56	479097.7	9.1	23-Jan-12	13:50	479327.8	9.1	23-Jan-12	15:50	478973.2	9.1
23-Jan-12	16:57	479139.9	9.1	23-Jan-12	12:57	479100.0	9.1	23-Jan-12	13:51	479333.2	9.1	23-Jan-12	15:52	478973.2	9.1
23-Jan-12	16:58	479142.2	9.1	23-Jan-12	12:58	479102.3	9.1	23-Jan-12	13:52	479338.6	9.1	23-Jan-12	15:54	478973.2	9.1
23-Jan-12	16:59	479144.5	9.1	23-Jan-12	12:59	479104.6	9.1	23-Jan-12	13:53	479344.0	9.1	23-Jan-12	15:56	478973.2	9.1
23-Jan-12	17:00	479146.8	9.1	23-Jan-12	13:00	479106.9	9.1	23-Jan-12	13:54	479349.4	9.1	23-Jan-12	15:58	478973.2	9.1
23-Jan-12	17:01	479149.1	9.1	23-Jan-12	13:01	479109.2	9.1	23-Jan-12	13:55	479354.8	9				



an Air Liquide company

**CERTIFICATE OF ANALYSIS**  
Grade of Product: EPA Protocol

Part Number	E04N199E3HA0023	Reference Number	160-401754137-1
Cylinder Number	GN0024388	Cylinder Volume	247.2 CF
Laboratory	124 - Plumsteadville - PA	Cylinder Pressure	2215 PSIG
PGVP Number	A12020	Valve Outlet	660
Gas Code	CO NO NOX SO2 BALN	Certification Date	Mar 26, 2020

Expiration Date: Mar 26, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/031 using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig (≈ 0.7 megapascals)

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	56.32 PPM	G1	+/- 0.6% NIST Traceable	03/18/2020, 03/26/2020
CARBON MONOXIDE	50.00 PPM	49.69 PPM	G1	+/- 0.5% NIST Traceable	03/18/2020
NITRIC OXIDE	50.00 PPM	50.32 PPM	G1	+/- 0.8% NIST Traceable	03/18/2020, 03/26/2020
SULFUR DIOXIDE	50.00 PPM	50.27 PPM	G1	+/- 0.8% NIST Traceable	03/18/2020, 03/26/2020
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	11010130	KAL004536	57.31 PPB CARBON MONOXIDE/NITROGEN	±0.04%	Oct 04 2022
NTRM	13010405	KAL004536	57.60 PPB NITRIC DIOXIDE/NITROGEN	±0.04%	Jul 23 2025
NTRM	13010405	KAL003084	57.60 PPB NITROGEN	±0.08%	Jul 23 2025
NTRM	16010235	KAL004419	57.69 PPB SULFUR DIOXIDE/NITROGEN	±0.08%	Dec 31 2024

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTIR - CO - 000928781	FTIR	Mar 12 2020
MKS FTIR - HC - 000928781	FTIR	Mar 05 2020
MKS FTIR - NOx - 000928781	FTIR	Mar 05 2020
MKS FTIR - SO2 - 000928781	FTIR	Mar 19 2020

Triad Data Available Upon Request

NOTES: Gross Weight: 47.7 Kg. Net Weight: 7.5 Kg.

Approved for Release



## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04N199E3HA0002 Reference Number: 160-401754138-1  
Cylinder Number: GN022433 Cylinder Volume: 247.2 CF  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2215 PSIG  
PGVP Number: A12020 Valve Outlet: 590  
Gas Code: CO NO NOX SO2 BALN Certification Date: Mar 26, 2020  
Expiration Date: Mar 26, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 820R-12231, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Date
NOX	80.00 PPM	79.86 PPM	G1	+/- 0.8% NIST Traceable	03/19/2020, 03/26/2020
CARBON MONOXIDE	80.00 PPM	80.10 PPM	G1	+/- 0.5% NIST Traceable	03/19/2020
NITRIC OXIDE	80.00 PPM	79.86 PPM	G1	+/- 0.8% NIST Traceable	03/19/2020, 03/26/2020
SULFUR DIOXIDE	80.00 PPM	79.96 PPM	G1	+/- 0.8% NIST Traceable	03/19/2020, 03/26/2020
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	11010130	KAL004536	97.31 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	Oct 04, 2022
NTRM	13010405	KAL003984	97.60 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jul 23, 2025
NTRM	13010405	KAL003984	97.60 PPM NOX/NITROGEN	+/- 0.8%	Jul 23, 2025
NTRM	16010235	KAL004419	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTIR - CO - 000928781	FTIR	Mar 12, 2020
MKS FTIR - NO - 000928781	FTIR	Mar 05, 2020
MKS FTIR - NOx - 000928781	FTIR	Mar 05, 2020
MKS FTIR - SO2 - 000928781	FTIR	Mar 19, 2020

Triad Data Available Upon Request

NOTES: Gross Weight: 47.7 Kg Net Weight: 7.5 Kg



*Michael A. Hughes*  
Approved for Release

Page 1 of 160-401754138-1

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E02N184E15A07B7 Reference Number: 160-401948145-1  
Cylinder Number: C0740033 Cylinder Volume: 145.8 CF  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG  
PGVP Number: A12020 Valve Outlet: 590  
Gas Code: O2, BALN Certification Date: Nov 11, 2020  
Expiration Date: Nov 11, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 820R-12231, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Date
OXYGEN	16.00 %	16.06 %	G1	+/- 0.2% NIST Traceable	11/11/2020
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16050503	CC109542	23.204 % OXYGEN/NITROGEN	+/- 0.2%	Dec 24, 2021

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS OXYMAT 6 - N1-W5-951 - O2	PARAMAGNETIC	Oct 26, 2020

Triad Data Available Upon Request

NOTES:  
Gross Weight: 27.8 Kg  
Net Weight: 4.7 Kg



*Cham*

Approved for Release

Page 1 of 160-401948145-1



## CERTIFICATE OF ANALYSIS

Customer Details:  
**ALS Laboratory Group (Thailand)**  
Production Order Number: 90132928  
Material Number: 478100-J-44  
Certification Date: 20-Jan-2016  
Expiry Date: 20-Jan-2024

Cylinder Description:  
**Steel 47.1**  
The measurement of this reference material is traceable to SI units. The traceability of this standard has been performed in accordance with the EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 820R-12231, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Certificate Number: 467615  
Cylinder Number: S50730  
Nominal Cylinder Contents: 6.520 M<sup>3</sup>  
Nominal Pressure: 145.0 Bar  
Valve Outlet: CGA 590 BRASS

Analytic: *Thi*  
THIRAT LOYRAT  
Approve: *Sub*  
SUBAN LASH THIRAT  
To Re-Order Please Quote: 478100-J-44

Comments:  
It is recommended that this product be not used below 5% of actual contents or should not be used when its gas pressure is below 150psig.  
Other impurities that affect analytical condition of this mixture shall be reported if it is more than 10% of maximum minor component.  
Keep and use it well-ventilated and secure area.

Page 1 of 2



## CERTIFICATE OF ANALYSIS

### Analytical Result

Component	Request Concentration	Certified Concentration	Certified Uncertainty	Method	Assay Date
Oxygen in Nitrogen	8.88 %	7.93 %	+/- 1% relative	(2) I-PB-354	20-Jan-2015

### Reference Standard used in Assay

Reference Standard	Cylinder No.	Concentration	Expired Date
Oxygen in Nitrogen	24362SSG	25.08 ± 0.13 %	19-Aug-2017

### Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Servomex 4100 O2 Analyzer	Paramagnetic	23-Dec-2015

Method of Analysis:  
1. Gas Chromatograph  
2. Paramagnetic Oxygen Analyzer  
3. Electrochemical Oxygen Analyzer  
4. Electrochemical Nitrogen Analyzer  
5. Total Hydrocarbon Analyzer  
6. Other specified

Cylinder Number: S50730  
Production Order Number: 90132928  
Certification Date: 20-Jan-2016  
Expiration Date: 20-Jan-2024

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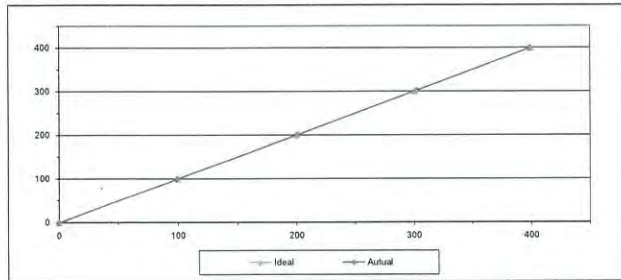




## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	PAUY077A	Equipment ID	RYG_FS0458
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

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



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

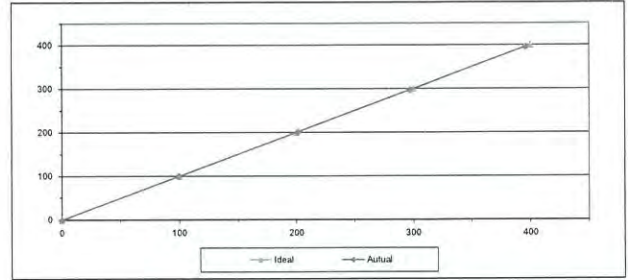
ALS Laboratory Group  
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## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	T100
Serial No.	1773	Equipment ID	RYG_FS0251
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40
2	200.00	201.80	1.80	0.90
3	300.00	297.20	-2.80	-0.93
4	400.00	396.00	-4.00	-1.00
AVERAGE (%)				-0.27



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

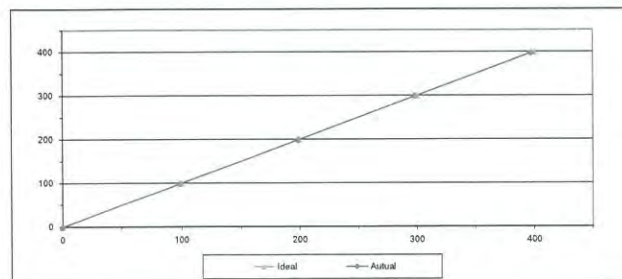
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## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	SO2 Analyzer
Manufacturer	Teledyne API	Model	T100
Serial No.	8081	Equipment ID	RYG_FS0534
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20
2	200.00	198.70	-1.30	-0.65
3	300.00	298.30	-1.70	-0.57
4	400.00	397.30	-2.70	-0.67
AVERAGE (%)				-0.80



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

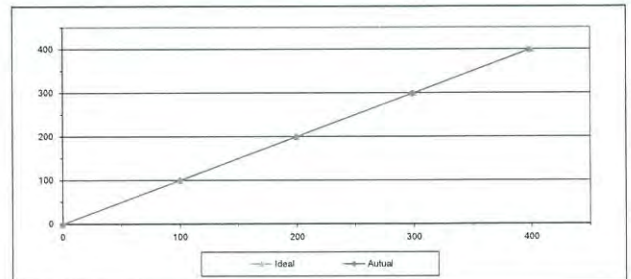
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## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	ROHWYDVW	Equipment ID	RYG_FS0458
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30
2	200.00	199.50	-0.50	-0.25
3	300.00	298.30	-1.70	-0.57
4	400.00	398.10	-1.90	-0.47
AVERAGE (%)				-0.30



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

ALS Laboratory Group  
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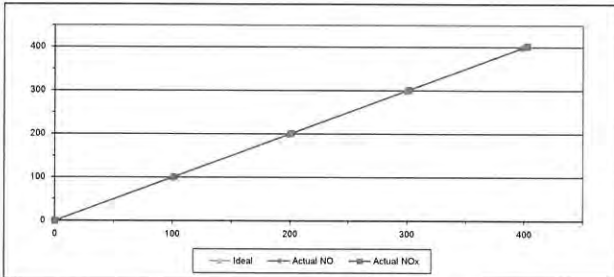




## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	7238	Equipment ID	RYG_FB0535
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	101.00	1.00	1.00
2	200.00	198.30	-1.70	-0.85	201.10	1.10	0.55
3	300.00	298.80	-1.20	-0.40	301.50	1.50	0.50
4	400.00	398.20	-1.80	-0.45	402.30	2.30	0.58
AVERAGE (%)				-0.40			0.55



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

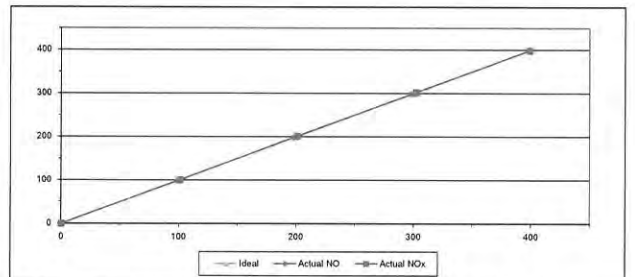
ALS Laboratory Group  
FORM NO. F 06-056 REVISION NO. - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	NOx Analyzer
Manufacturer	Teledyne API	Model	T200
Serial No.	2198	Equipment ID	RYG_FB0252
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20	101.00	1.00	1.00
2	200.00	198.00	-2.00	-1.00	201.30	1.30	0.65
3	300.00	298.10	-1.90	-0.63	302.30	2.30	0.77
4	400.00	398.20	-1.80	-0.45	398.80	-1.20	-0.30
AVERAGE (%)				-0.64			0.44



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

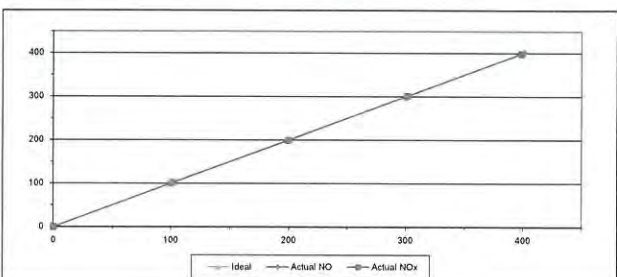
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## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	NV0ER3YH	Equipment ID	RYG_FB0459
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.50	-0.50	-0.50	101.80	1.80	1.80
2	200.00	198.70	-1.30	-0.65	199.70	-0.30	-0.15
3	300.00	301.10	1.10	0.37	301.50	1.50	0.50
4	400.00	401.30	1.30	0.33	398.90	-1.10	-0.28
AVERAGE (%)				-0.08			0.39



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

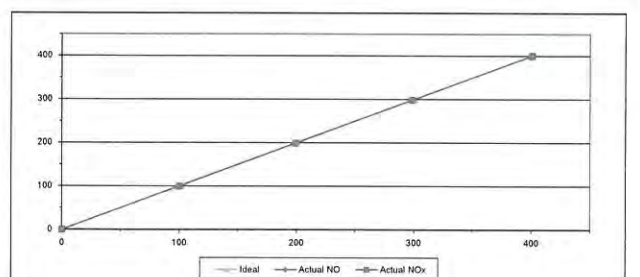
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## MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	T2TBYRLL	Equipment ID	RYG_FB0457
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.30	-1.70	-1.70	100.20	0.20	0.20
2	200.00	198.40	-1.60	-0.80	199.60	-0.40	-0.20
3	300.00	297.10	-2.90	-0.97	298.50	-1.50	-0.50
4	400.00	398.50	-1.40	-0.35	400.70	0.70	0.17
AVERAGE (%)				-0.74			-0.05



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)  
Assistant General Manager

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

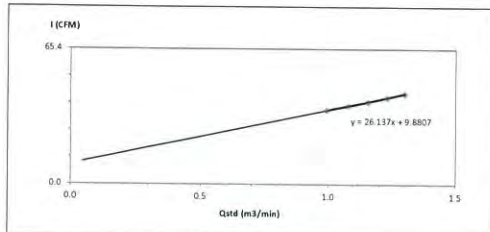




### High Volume Air Sampler Calibration Worksheet

Project Site: Amata B. Grimm Power (Rayong) 3 Limited  
Calibrate Location: โรงบำบัดน้ำเสีย  
Calibrate Date: 15-Nov-22  
Calibration Sheet No.: C-151122-RYG-PS0400  
Calibrator ID: RYG-PS0205  
Calibrator Model: TE-5028A  
Calibrator S/N: 1166  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 30  
High Volume ID: RYG-PS0400  
High Volume Model: TE-5009X  
High Volume S/N: 5691  
Calibrator Slope: 1.50765  
Calibrator Intercept: -0.02043

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.9942	36	Slope: 26.1375 Intercept: 9.8807 Correlation Coefficient: 0.9992
2	2.6	1.0790	38	
3	3.0	1.1575	40	
4	3.4	1.2309	42	
5	3.8	1.3002	44	



Calibrated by: N. Nontachai Uppathamp  
(Mr. Nontachai Uppathamp)  
Field Scientist (1)

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

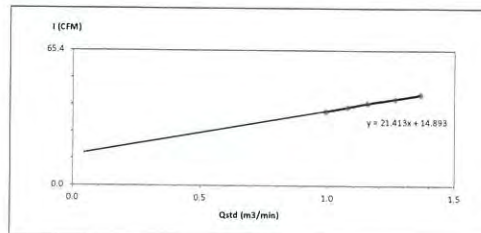
FORM NO. F 06-074 REVISION NO. - ISSUE DATE 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site: Amata B. Grimm Power (Rayong) 3 Limited  
Calibrate Location: โรงบำบัดน้ำเสีย  
Calibrate Date: 15-Nov-22  
Calibration Sheet No.: C-151122-RYG-PS0188  
Calibrator ID: RYG-PS0205  
Calibrator Model: TE-5028A  
Calibrator S/N: 1166  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 30  
High Volume ID: RYG-PS0188  
High Volume Model: TE-5009X  
High Volume S/N: 4796  
Calibrator Slope: 1.50765  
Calibrator Intercept: -0.02043

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.9942	36	Slope: 21.4130 Intercept: 14.8934 Correlation Coefficient: 0.9981
2	2.6	1.0790	38	
3	3.0	1.1575	40	
4	3.6	1.2660	42	
5	4.2	1.3658	44	



Calibrated by: N. Nontachai Uppathamp  
(Mr. Nontachai Uppathamp)  
Field Scientist (1)

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

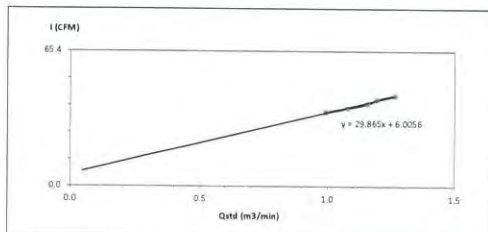
FORM NO. F 06-074 REVISION NO. - ISSUE DATE 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site: Amata B. Grimm Power (Rayong) 3 Limited  
Calibrate Location: โรงบำบัดน้ำเสีย  
Calibrate Date: 15-Nov-22  
Calibration Sheet No.: C-151122-RYG-PS0189  
Calibrator ID: RYG-PS0205  
Calibrator Model: TE-5028A  
Calibrator S/N: 1166  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 30  
High Volume ID: RYG-PS0189  
High Volume Model: TE-5009X  
High Volume S/N: 4797  
Calibrator Slope: 1.50765  
Calibrator Intercept: -0.02043

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.9942	36	Slope: 29.8645 Intercept: 6.0056 Correlation Coefficient: 0.9924
2	2.6	1.0790	38	
3	3.0	1.1575	40	
4	3.2	1.1948	42	
5	3.6	1.2660	44	



Calibrated by: N. Nontachai Uppathamp  
(Mr. Nontachai Uppathamp)  
Field Scientist (1)

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

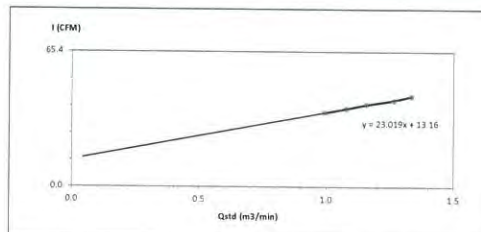
FORM NO. F 06-074 REVISION NO. - ISSUE DATE 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site: Amata B. Grimm Power (Rayong) 3 Limited  
Calibrate Location: โรงบำบัดน้ำเสีย  
Calibrate Date: 15-Nov-22  
Calibration Sheet No.: C-151122-RYG-PS0191  
Calibrator ID: RYG-PS0205  
Calibrator Model: TE-5028A  
Calibrator S/N: 1166  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 30  
High Volume ID: RYG-PS0191  
High Volume Model: TE-5009X  
High Volume S/N: 5330  
Calibrator Slope: 1.50765  
Calibrator Intercept: -0.02043

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.9942	36	Slope: 23.0186 Intercept: 13.1601 Correlation Coefficient: 0.9981
2	2.6	1.0790	38	
3	3.0	1.1575	40	
4	3.6	1.2660	42	
5	4.0	1.3334	44	



Calibrated by: N. Nontachai Uppathamp  
(Mr. Nontachai Uppathamp)  
Field Scientist (1)

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

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



## Certificate of Calibration

Represent to Certificate of Calibration /PTC/07/22102

Certificate No.: PTC/07/22102 Page: 1 of 2  
Equipment: Digital Balance Condition: Normal  
Manufacturer: Sartorius Serial No: 25409664  
Model: LA1305-F ID No: RYG\_EN0001  
Type of Balance: Single Interval



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

Environment Condition: Temperature 23.9 °C ± 0.3 °C  
Humidity 58.1 %RH ± 4.4 %RH  
Air density 1.17 kg/m<sup>3</sup>

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

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co., Ltd.  
NSC-ONSC Accreditation No. Calibration 0189

Date Received: March 23, 2022

Calibration Date: March 23, 2022

Issued Date: March 25, 2022

Calibration By: Mr Rungraje Metakul

REVIEW BY: *Tharatt*  
APPROVED BY: *D. K.*  
NEXT CAL DATE: 23/09/23



Approved By: *(Mr. Keattisak Kerdlo)*  
Laboratory Manager

Reviewed by: *(Mr. Kriangsak Kalasin)*

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
This 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 the Expression of Uncertainty in Measurement (GUM). The effect that the result relate only to the items calibrated.  
This calibration certificate shall not be reproduced except in full, without written approval from Penta Calibration Co., Ltd.

PTC-PAC-07-02 3 Feb 2020

Represent to Certificate of Calibration /PTC/07/22102

Certificate No.: PTC/07/22102

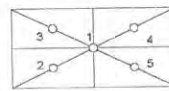
Page: 2 of 2

## Measurement Results:

Without Adjustment

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Eccentricity test 50 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0001	0.0000	0.0001
Maximum deviation: 0.0001				

Repeatability Test: Weight to be 1/2 ≤ L<sub>1</sub> ≤ Maximum capacity

Determination of the standard deviation of weighing balance, Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
10	0.00047
100	0.00008

Error of Indication: from nominal value, Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.00026	2.87
0.01	0.01000	0.0100	0.0000	0.00026	2.65
0.05	0.05000	0.0500	0.0000	0.00026	2.65
0.1	0.10000	0.1000	0.0000	0.00026	2.65
0.5	0.50000	0.4999	0.0001	0.00026	2.65
1	1.00000	0.9999	0.0001	0.00026	2.65
2	2.00000	1.9999	0.0001	0.00026	2.65
5	5.00001	5.0000	0.0000	0.00026	2.65
10	10.00000	10.0001	-0.0001	0.00026	2.65
20	20.00003	20.0001	-0.0001	0.00026	2.52
100	100.00004	100.0001	-0.0001	0.00027	2.18

Note: Weight of adjust (g)

The End of Certificate

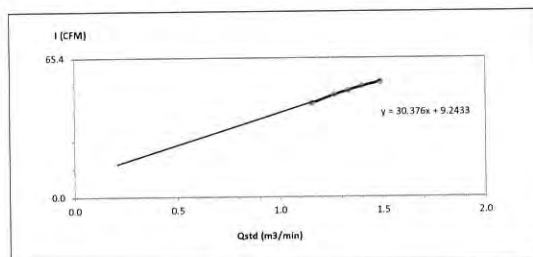
PTC-PAC-07-02 3 Feb 2020



## High Volume Air Sampler Calibration Worksheet

Project Site: Amata B. Grimm Power (Rayong) 3 Limited  
Calibrate Location: โรงบำบัดน้ำเสีย  
Calibrate Date: 15-Nov-22  
Calibration Sheet No.: C-151122-RYG\_FS0181  
Calibrator ID: RYG\_FS0205  
Calibrator Model: TE-S028A  
Calibrator S/N: 1166  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 30  
High Volume ID: RYG\_FS0181  
High Volume Model: TE-S170D  
High Volume S/N: 5334  
Calibrator Slope: 1.50765  
Calibrator Intercept: -0.02043

Test No.	Delta H <sub>2</sub> O (Inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.0	1.1575	44	Slope: 30.3764 Intercept: 9.2433 Correlation Coefficient: 0.9948
2	3.6	1.2660	48	
3	4.0	1.3334	50	
4	4.4	1.3975	52	
5	5.0	1.4884	54	



Calibrated by: *(Mr. Nontachai Uppathamp)*  
Field Scientist(1)

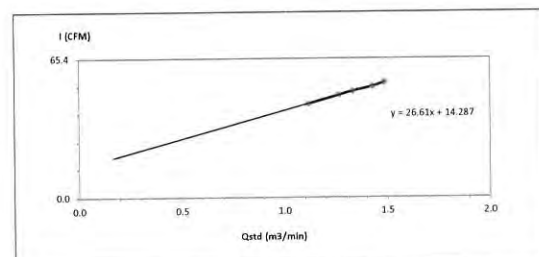
Approved by: *(Mr. Noppong Juntarup)*  
Enviro Field Coordinator Scientist (3)



## High Volume Air Sampler Calibration Worksheet

Project Site: Amata B. Grimm Power (Rayong) 3 Limited  
Calibrate Location: โรงบำบัดน้ำเสีย  
Calibrate Date: 15-Nov-22  
Calibration Sheet No.: C-151122-RYG\_FS0393  
Calibrator ID: RYG\_FS0205  
Calibrator Model: TE-S028A  
Calibrator S/N: 1166  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 30  
High Volume ID: RYG\_FS0393  
High Volume Model: TE-S170D  
High Volume S/N: 5682  
Calibrator Slope: 1.50765  
Calibrator Intercept: -0.02043

Test No.	Delta H <sub>2</sub> O (Inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.8	1.1189	44	Slope: 26.6105 Intercept: 14.2870 Correlation Coefficient: 0.9987
2	3.6	1.2660	48	
3	4.0	1.3334	50	
4	4.6	1.4284	52	
5	5.0	1.4884	54	



Calibrated by: *(Mr. Nontachai Uppathamp)*  
Field Scientist(1)

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

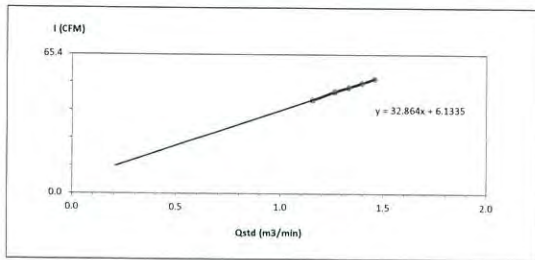




### High Volume Air Sampler Calibration Worksheet

Project Site: Amata B. Grimm Power (Rayong) 3 Limited  
Calibrate Location: โรงงานผลิตและประกอบชิ้นส่วนอากาศยาน  
Calibrate Date: 15-Nov-22  
Calibration Sheet No.: C-151122-RYG-FS0173  
Calibrator ID: RYG-FS0205  
Calibrator Model: TE-5028A  
Calibrator S/N: 1166  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 30  
High Volume ID: RYG-FS0173  
High Volume Model: TE-5170D  
High Volume S/N: 4799  
Calibrator Slope: 1.50765  
Calibrator Intercept: -0.02043

Test No.	Delta H <sub>2</sub> O (Inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	3.0	1.1575	44	Slope: 32.8639 Intercept: 6.1335 Correlation Coefficient: 0.9991
2	3.6	1.2660	48	
3	4.0	1.3334	50	
4	4.4	1.3975	52	
5	4.8	1.4587	54	



Calibrated by: *Nlypt*  
(Mr. Nontchai Uppathamp)  
Field Scientist(1)

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

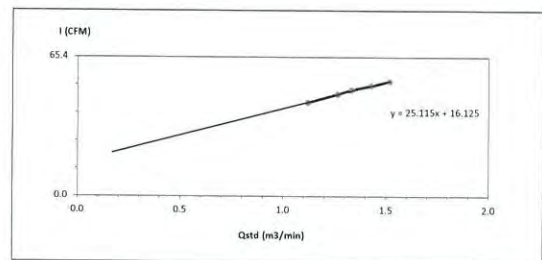
FORM NO. F-06-073 REVISION NO. - ISSUE DATE: 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site: Amata B. Grimm Power (Rayong) 3 Limited  
Calibrate Location: ศูนย์พัฒนาเด็กเล็กองค์การบริหารส่วนตำบลบางช้างพร  
Calibrate Date: 15-Nov-22  
Calibration Sheet No.: C-151122-RYG-FS0180  
Calibrator ID: RYG-FS0205  
Calibrator Model: TE-5028A  
Calibrator S/N: 1166  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 30  
High Volume ID: RYG-FS0180  
High Volume Model: TE-5170D  
High Volume S/N: 1328  
Calibrator Slope: 1.50765  
Calibrator Intercept: -0.02043

Test No.	Delta H <sub>2</sub> O (Inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression
1	2.8	1.1189	44	Slope: 25.1153 Intercept: 16.1252 Correlation Coefficient: 0.9978
2	3.6	1.2660	48	
3	4.0	1.3334	50	
4	4.6	1.4284	52	
5	5.2	1.5174	54	



Calibrated by: *Nlypt*  
(Mr. Nontchai Uppathamp)  
Field Scientist(1)

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

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



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

### CERTIFICATE OF CALIBRATION

Certificate No. WS 02032022  
Page 1 of 2 pages

Measurement Item: Cup anemometer with data logger  
Manufacturer: Data logger: Teclonix  
Cup anemometer: Teclonix  
Model/Type: Data logger: 280 WS 2518  
Cup anemometer: WS 020  
Serial Number: Data logger: A4416  
Cup anemometer:  
ID No: Data logger: B04119141  
Cup anemometer:  
Customer: All laboratory group (Rayong) Ltd.  
104 Phatthana Road, Prachinburi Rd, Khwaeng Suan Luang, Sub District Suan Luang, Bangkok 10000, Thailand  
Test Conditions: Wind tunnel: multi fan sector wind  
Anemometer: (Type, size)  
Direction of measuring: 90°  
Blowing: (Type, size)  
Test Conditions: A: Temperature: 25.1 ± 0.5 °C  
B: Pressure: 1.01324 ± 0.001 kPa  
Relative A: Humidity: 51.6 ± 0.5 %RH  
Calibration Procedure: Calibration was carried out by JAC  
Ref: 61400-12.1, ISO 9001:2015, Performance Measurements of Calibration, P.40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000  
Traceability: This calibration is traceable to the SI units through the use of the measurements according to the international system of units (SI) through National Institute of Metrology (NIM) (NIST).  
Measurement Date: MAR 15, 2022  
Issue Date: MAR 17, 2022  
Declarations: ☒ Mr. Nontchai Uppathamp  
☐ Mr. Noppong Juntarupan  
Approved Signature: *Mr. Nontchai Uppathamp*  
(Mr. Nontchai Uppathamp)  
Signature: *Mr. Noppong Juntarupan*  
(Mr. Noppong Juntarupan)



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Continuation of Certificate of Calibration Number

Certificate No. WS 02032022  
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment  
Calibration is the range of 1 - 10 m/s at a calibration interval of 1 m/s.  
The results of calibration and associated measurement uncertainties are reported in the table below.

Vel. Reading m/s	Vel. Reading m/s	Error m/s	Uncertainty (%)
2.092	1.0	0.2	2.5
4.128	4.1	0.0	1.7
6.103	6.1	0.1	1.1
8.091	8.0	0.0	2.2
10.01	10.0	0.0	1.4
11.94	12.0	0.0	1.5
13.84	14.1	0.1	1.5
15.69	16.0	0.0	1.8
17.50	18.1	0.1	2.0
19.28	19.5	0.1	0.85
21.01	21.0	0.0	1.1
22.71	22.0	0.0	0.85
24.34	24.1	0.0	1.05
25.95	26.0	0.1	0.93
27.51	27.5	0.0	1.9
29.01	29.5	0.2	4.6

UNC: 100% Under Calibration

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

#### Appendix 1: Instrumentation

ID	Serial	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
2	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
3	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
4	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
5	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
6	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
7	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
8	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
9	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s
10	1001000	TECLONIX	280 WS 2518	Aug 07, 2021	MA-0024-21	0 - 30 m/s

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





**CERTIFICATE OF CALIBRATION**

Certificate No. WD-02032022  
Page 1 of 2 pages

Measurement Item: Wind direction sensor with data logger

Manufacturer: Data logger: Novaynx  
Wind direction sensor: Novaynx

Model/Type: Data logger: Z00-WD-25LB  
Wind direction sensor: WS-02P

Serial Number: Data logger: A4916  
Wind direction sensor: -

ID No: Data logger: BKR-F8016  
Wind direction sensor: -

Customer: ALS laboratory group (Thailand) co., Ltd.  
104 Phatthanasak Rd. Phatthanasak 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 one laser is used for axis control. The measurement was taken at 45° intervals in clockwise and counter-clockwise 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. 02/1082014, Certificate No. RW564/0025.

Measurement Date: MAR 17, 2022  
Issued Date: MAR 21, 2022

Calibrated by:  
☒ Mr. Somchai Thairakad  
☐ Ms. Chitra Wuthitayak



Approved Signature: *[Signature]*  
M. Panyia Boonchanden  
Calibration Department Manager

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Continuation of Certificate of Calibration Number

Certificate No. WD-02032022  
Pages 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	0	0	0	3.0
2		45	45	43	-2	3.0
3		90	90	87	-3	3.0
4		135	135	133	-2	3.0
5		180	180	180	0	3.0
6		225	225	228	3	3.0
7		270	270	274	4	3.0
8		315	315	319	4	3.0
9	Counter Clockwise	0/360	0	0	0	3.0
10		45	45	43	-2	3.0
11		90	90	87	-3	3.0
12		135	135	133	-2	3.0
13		180	180	180	0	3.0
14		225	225	228	3	3.0
15		270	270	274	4	3.0
16		315	315	319	4	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\*\*\*



**CERTIFICATE OF CALIBRATION**

Certificate No. WS-01072021  
Page 1 of 2 pages

Measurement Item: Flow measurement with data logger

Manufacturer: Data logger: Novaynx  
Flow measurement: Novaynx

Model/Type: Data logger: 113-WD-160  
Flow measurement: WS-200

Serial Number: Data logger: 1135  
Flow measurement: -

A No: Data logger: BKR-F8016  
Flow measurement: -

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

Test Conditions: Wind speed: 10m/s test section area: 100 cm²  
Flow rate: 100 L/min  
Flow rate: 100 L/min  
Flow rate: 100 L/min

Test Conditions: A: 100 L/min  
B: 100 L/min  
C: 100 L/min

Calibration Procedure: Calibration was carried out in accordance with ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, and ISO 19011:2018. The calibration was performed by the Calibration Department Manager.

Traceability: This calibration is traceable to the international system of units (SI) through National Institute of Standards and Technology (NIST) Certificate of Calibration No. 1013-1-01.

Measurement Date: JUN 20, 2021  
Issued Date: JUN 20, 2021

Calibrated by:  
☒ Mr. Somchai Thairakad  
☐ Ms. Chitra Wuthitayak



Approved Signature: *[Signature]*  
M. Panyia Boonchanden  
Calibration Department Manager

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Continuation of Certificate of Calibration Number

Certificate No. WS-01072021  
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment  
Calibration in the range of 0 - 10 m/s at a calibration interval of 10 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>unc</sub> Reading m/s	Error (m/s)	Uncertainty (%)
2.071	1.6	0.5	2.7
4.089	3.6	0.5	1.1
6.071	5.9	0.1	1.03
8.071	7.8	0.3	3.74
10.071	10.0	0.0	0.60
12.071	12.0	0.0	0.48
14.071	14.0	0.1	0.38
16.071	16.0	0.0	0.33
18.071	18.0	0.0	0.33
20.071	20.0	0.1	0.46
22.071	22.0	0.0	0.45
24.071	24.0	0.1	0.42
26.071	26.0	0.0	0.37
28.071	28.0	0.0	0.33
30.071	30.0	0.0	0.33
32.071	32.0	0.0	0.33
34.071	34.0	0.0	0.33
36.071	36.0	0.0	0.33

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: Measurement Data**

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Number	Range
1	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
2	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
3	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
4	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
5	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
6	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
7	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
8	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
9	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s
10	Flowmeter	Novaynx	113-WD-160	JUN 17, 2021	WS-01072021	0 - 10 m/s

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











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## CERTIFICATE OF CALIBRATION

Certificate No: WD-14072021  
Page 1 of 2 pages

Measurement Item: Wind direction sensor with data logger

Manufacturer: Data logger: Novinky  
Wind direction sensor: Novinky

Model/Type: Data logger: 200-WS-251R  
Wind direction sensor: WS-02P

Serial Number: Data logger: A5316  
Wind direction sensor

ID No: Data logger: RRU-F50A14  
Wind direction sensor

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

Environmental Condition:  
The measurement was carried out in an air-conditioned room of 25±0.5°C and relative humidity of 40±5% RH.

Measurement Method:  
The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and the laser is used for axis control. The measurements were taken at 45° intervals in clockwise and counter-clockwise directions.

Note: The UUC was carried up to 1 hour, which is the calibration being performed.

### Traceability

The measurement results are traceable to the international system of units (SI) through Certificate No. 02694410454.  
Certificate No. KW503/0044.

Measurement Date: 22/05/2021  
Issued Date: 23/05/2021

Performed by:  
☒ Mr. Sornrat Thairat  
☐ Mr. Chiraphat Waiwong



Approved Signatory:

*[Signature]*

Mr. Parinya Booncharan  
Technical Support  
and Calibration Manager

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Continuation of Certificate of Calibration Number

Certificate No: WD-14072021  
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	43	-2	3.0
3		90	90	87	-3	3.0
4		135	135	132	-3	3.0
5		180	180	179	-1	3.0
6		225	225	226	1	3.0
7	Counter Clockwise	270	270	273	3	3.0
8		315	315	318	3	3.0
9		0/360	360	359	-1	3.0
10		45	45	43	-2	3.0
11		90	90	87	-3	3.0
12		135	135	132	-3	3.0
13	Clockwise	180	180	179	-1	3.0
14		225	225	226	1	3.0
15		270	270	273	3	3.0
16		315	315	318	3	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\*\*\*



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## CERTIFICATE OF CALIBRATION

Certificate No: WS-01052022  
Page 1 of 2 pages

Measurement Item: Cup anemometer with data logger

Manufacturer: Data logger: Novinky  
Cup anemometer: Novinky

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

Serial Number: Data logger: A4940  
Cup anemometer

ID No: Data logger: BKK-F50165  
Cup anemometer

Customer: A.S. laboratory group (Thailand) Co., Ltd.  
104 Phathanakan 40, Phathanakan 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: 40 mm  
Blockage ratio of test object: 0.111

Test Conditions: Air temperature: 25.3 ±0.8 °C  
Air pressure: 1013.3 ±0.4 hPa  
Relative air humidity: 51% ±3.5 %RH

Calibration Procedure: Calibration was carried out base on:  
ISO 61400-12-1 (5.1) 2005-Power Performance Measurements of Electricity Producing Wind Turbines  
IEC61400-12-1 (5.1) 2005-Power Performance Measurements of Electricity Producing Wind Turbines  
IEC61400-12-1 (5.1) 2005-Power Performance Measurements of Electricity Producing Wind Turbines

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 (NIM).

Measurement Date: May 03/2022  
Issued Date: May 04/2022

Performed by:  
☒ Mr. Sornrat Thairat  
☐ Mr. Chiraphat Waiwong



Approved Signatory:

*[Signature]*

Mr. Parinya Booncharan  
Calibration Department Manager

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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 table below.

V <sub>ref</sub> Reading m/s	V <sub>unc</sub> Reading m/s	Error (m/s)	Uncertainty (%)
2.079	2.0	-0.1	2.4
4.148	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	0.0	0.58
11.99	12.0	0.2	0.72
14.02	14.0	0.0	0.47
16.00	16.0	0.0	0.43
18.02	18.0	0.0	0.55
19.99	20.0	0.1	0.51
21.01	21.0	0.2	0.53
23.01	23.0	0.1	0.69
25.00	25.0	0.0	0.60
27.05	27.0	-0.1	0.86
30.09	30.0	0.0	1.7
32.07	32.0	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	Wind speed	YESCO INC.	0552146	Aug 07/2021	MA-003421	0 - 31 m/s
2	Pressure Differential Pressure Meter	Zigbee	DPH2400	Aug 07/2021	MA-003421	0 - 20 mPa
3	Air velocity transducer (hot wire)	TSI INC.	8455-12	Aug 08/2021	MA-003421	0 - 8 m/s
4	Temperature	Zigbee	DS18B20	Mar 30/2022	MA-003421	30 - 70°C
5	Relative humidity	Zigbee	DS18B20	Mar 30/2022	MA-003421	0 - 100 %RH
6	Anemometer pressure	Zigbee	DS18B20	Mar 30/2022	MA-003421	0 - 100 mPa
7	Wind turbine	YESCO	MP-3300	Aug 07/2021	MA-003421	0 - 40 m/s

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







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

## CERTIFICATE OF CALIBRATION

Certificate No: WD-01052022  
Page 1 of 2 pages

Measurement Item: Wind direction sensor with data logger

Manufacturer: Data logger: Novamix  
Wind direction sensor: Novamix

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

Serial Number: Data logger: A4940  
Wind direction sensor:

ID No: Data logger: BKH\_F50155  
Wind direction sensor:

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

### Environmental Condition:

The measurement was carried out in an ambient temperature of (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° interval 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. Q21084014, Certificate No. HW564/0025.

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

Calibrated by:  
☒ Mr. Somchai Teeraporn  
☐ Miss Jiraporn Veraporn



Approved Signatory:

M. Panya Booncharoen  
Calibration Supervisor/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,  
Wathapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

Continuation of Certificate of Calibration Number

Certificate No: WD-01052022  
Pages 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\*\*\*



## 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.: ACC22023  
Pages: 1 of 3

## Calibration Certificate

Equipment: SOUND CALIBRATOR  
Manufacturer: RION  
Model: NC-74  
Serial No.: 34178123  
ID No.: RYG\_FS0215

Condition As Found: GOOD

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

Calibrated by: Nathakorn Pisutpaan

Approved by:

T. Petchur  
( Thanakul Petchur )

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

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

Continuation of Calibration Certificate

Cert. No.: ACC22023  
Job No.: VC65AC0077  
Pages: 2 of 3

Calibration Procedure: CP-AC-03

### Calibration Method:

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

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

### Condition of this result of calibration:

#### 1. Reference Standard Instruments:

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	ET-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04-0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_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).



## Continuation of Calibration Certificate

Cert. No. : ACC22023  
Job No. : VC65AC0077  
Pages : 3 of 3

## Result of calibration :

## 1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.04	0.04	0.14	0.40

## 2. Frequency

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

## 3. Total distortion

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

451-451/1 Srinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.  
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL22234  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No. : 01073608 / 172153 / 85748  
ID No. : RYG\_FS0387

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

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai  
( Thanakul Petchurai )

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## Continuation of Calibration Certificate

Cert. No. : ACL22234  
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-42KA1	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

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## Continuation of Calibration Certificate

Cert. No. : ACL22234  
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

QF-TS12-04-04-020664



## Continuation of Calibration Certificate

Cert. No. : ACL22234  
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 )
15.4

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

Frequency Weighting	Measured value ( dB )
A - weight	12.0
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	0.4	0.3	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.0	-0.9	-0.9	±5.0

QF-TS12-04-04-020664

T. Retch.

## Continuation of Calibration Certificate

Cert. No. : ACL22234  
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	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## 6. Long - term stability

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

QF-TS12-04-04-020664

T. Retch.

## Continuation of Calibration Certificate

Cert. No. : ACL22234  
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	119.0	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	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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T. Retch.

## Continuation of Calibration Certificate

Cert. No. : ACL22234  
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	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

## 10. Peak C sound level

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

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

QF-TS12-04-04-020664

T. Retch.



## Continuation of Calibration Certificate

Cert. No. : ACL22234  
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		
119.6	89.7	-29.9	±1.5

## 12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

451-451/1 Sirinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.  
Tel: 0-2435-8800 Fax: 0-2433-1679 e-mail: center@sithiphorn.com http://www.sithiphorn.comCert. No. : ACL22183  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No. : 01073423 / 169513 / 73684  
ID No. : RYG\_FS0386

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 : 22 AUGUST 2022  
Calibration Date : 26-31 AUGUST 2022  
Date of Issue : 02 SEPTEMBER 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

( Thanakul Petchurai )

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## Continuation of Calibration Certificate

Cert. No. : ACL22183  
Job No. : VC65AC0077  
Pages : 3 of 8

## Summary of Measurement Result :

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

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22183  
Job No. : VC65AC0077  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value ( dB )
15.4

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

Frequency Weighting	Measured value ( dB )
A - weight	12.6
C - weight	18.6
Flat	24.5

## 3. Acoustical signal tests of frequency weightings

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.3	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	1.5	1.5	1.6	± 5.0

QF-TS12-04-04-020664



## Continuation of Calibration Certificate

Cert. No. : ACL22183  
Job No. : VC65AC0077  
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	0.0	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	94.1	0.1	± 0.3

QF-TS12-04-04-020664

T. Reth.

## Continuation of Calibration Certificate

Cert. No. : ACL22183  
Job No. : VC65AC0077  
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	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

QF-TS12-04-04-020664

T. Reth.

## Continuation of Calibration Certificate

Cert. No. : ACL22183  
Job No. : VC65AC0077  
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, L <sub>peak</sub> ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	-
One	136.4	135.8	-0.6	±3.0

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.1	0.1	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

T. Reth.

## Continuation of Calibration Certificate

Cert. No. : ACL22183  
Job No. : VC65AC0077  
Pages : 8 of 8

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Reth.



# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbunru, Bangplud Bangkok 10700 THAILAND.  
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Cert. No. : ACL22154  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00734218 / 146937 / 34368  
ID No.: RYG\_FS0031

Condition As Found : GOOD

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

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchur*  
( Thanakul Petchur )

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

QF-TS12-04-04-020664

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22154  
Job No. : VC65AC0068  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

### Calibration Method :

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

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

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP. 04-0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP. 03-0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL-BP. 05-0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3005-22	22-Feb-23

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

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

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

QF-TS12-04-04-020664

*T. Petchur*

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22154  
Job No. : VC65AC0068  
Pages : 3 of 8

### Summary of Measurement Result :

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

QF-TS12-04-04-020664

*T. Petchur*

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22154  
Job No. : VC65AC0068  
Pages : 4 of 8

### Result of calibration :

#### 1. Absolute sensitivity

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

#### 2. Self-generated noise

##### 2.1 Normal test

Measured Value (dB)
20.1

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

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.4
Flat	23.1

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

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.5	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.5	-1.5	-1.4	±5.0

QF-TS12-04-04-020664

*T. Petchur*



## Continuation of Calibration Certificate

Cert. No. : ACL22154  
Job No. : VC65AC0068  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## 6. Long - term stability

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

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22154  
Job No. : VC65AC0068  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	128.9	-0.1	± 1.1
124.0	123.9	-0.1	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

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## Continuation of Calibration Certificate

Cert. No. : ACL22154  
Job No. : VC65AC0068  
Pages : 7 of 8

## 8. Level linearity including the level range control

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

## 9. 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
	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	135.7	-0.7	±3.0

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

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22154  
Job No. : VC65AC0068  
Pages : 8 of 8

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664



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Cert. No. : ACC22013  
Pages : 1 of 3

## Calibration Certificate

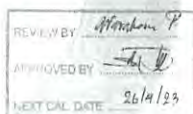
Equipment : SOUND CALIBRATOR  
Manufacturer : RION  
Model : NC-74  
Serial No. : 34178121  
ID No. : RYG\_FS0213

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 : 22 APRIL 2022  
Calibration Date : 26 APRIL 2022  
Date of Issue : 29 APRIL 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchur*  
( Thanakul Petchurai )

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QF-TS12-04-04-020664

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22013  
Job No. : VC65AC0054  
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).

QF-TS12-04-04-020664

*T. Petchur*

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22013  
Job No. : VC65AC0054  
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	94.11	0.11	0.14	0.40

### 2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1003.1	0.3	0.1	1.0

### 3. Total distortion

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

*T. Petchur*

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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Cert. No. : ACL22025  
Pages : 1 of 8

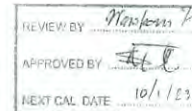
## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00734221 / 145286 / 34371  
ID No. : RYG\_FS0027

Condition As Found : GOOD

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

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %  
Received Date : 05 JANUARY 2022  
Calibration Date : 10-12 JANUARY 2022  
Date of Issue : 13 JANUARY 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchur*  
( Thanakul Petchurai )

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## Continuation of Calibration Certificate

Cert. No. : ACL22025  
Job No. : VC65AC0040  
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-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP./05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP./03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-Q7774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

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

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

3.1 National Institute of Metrology (Thailand).

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

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22025  
Job No. : VC65AC0040  
Pages : 3 of 8

## Summary of Measurement Result :

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

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22025  
Job No. : VC65AC0040  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
16.2

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

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	18.0
Flat	23.9

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.6	± 1.5
1000	0.0	0.0	0.1	± 1.0
8000	-2.3	-2.3	-2.3	±5.0

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22025  
Job No. : VC65AC0040  
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	94.1	0.1	± 0.3

QF-TS12-04-04-020664



## Continuation of Calibration Certificate

Cert. No. : ACL22025  
Job No. : VC65AC0040  
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	38.9	-0.1	±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

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22025  
Job No. : VC65AC0040  
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, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-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. : ACL22025  
Job No. : VC65AC0040  
Pages : 8 of 8

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

451-451/1 Srinthorn Rd, Bangumru, Bangplud Bangkok 10700 THAILAND.  
Tel: 0-2435-8800 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL22160  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No.: 00472132 / 169445 / 72466  
ID No.: RYG FS0304

Condition As Found : GOOD

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

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

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

Calibrated by : Nathakorn Pisutpaisan

Approved by :   
( Thanakul Petcharai )

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

QF-TS12-04-04-020664



## Continuation of Calibration Certificate

Cert. No. : ACL22160  
Job No. : VC65AC0069  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

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

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

## Condition of this result of calibration :

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL_BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL_BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-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).

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## Continuation of Calibration Certificate

Cert. No. : ACL22160  
Job No. : VC65AC0069  
Pages : 3 of 8

## Summary of Measurement Result :

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

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## Continuation of Calibration Certificate

Cert. No. : ACL22160  
Job No. : VC65AC0069  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A - weight	9.9
C - weight	16.3
Flat	22.1

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-1.1	-1.1	-1.1	± 5.0

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## Continuation of Calibration Certificate

Cert. No. : ACL22160  
Job No. : VC65AC0069  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## 6. Long - term stability

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

QF-TS12-04-04-020664



## Continuation of Calibration Certificate

Cert. No. : ACL22160  
Job No. : VC65AC0069  
Pages : 6 of 8

## 7. Level linearity on the reference level range

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

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## Continuation of Calibration Certificate

Cert. No. : ACL22160  
Job No. : VC65AC0069  
Pages : 7 of 8

## 8. Level linearity including the level range control

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

## 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	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, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.3	-1.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
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. : ACL22160  
Job No. : VC65AC0069  
Pages : 8 of 8

## 11. Overload indication

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

## 12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

251-45111 Sinitthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND  
Tel: 0-2435-8800 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL22059  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 Microphone UC-52 Preamplifier NH-24  
Serial No. : 00734220-145272 / 34370  
ID No. : RYG TS0026

Condition As Found : GOOD

Customer : A1 S1 LABORATORY GROUP (THAI) AND CO., LTD.  
164 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHUWAENG PHATTHANAKAN, KHUET SUAN LUANG,  
BANGKOK, 10250 THAI AND

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

Received Date : 14 JANUARY 2022  
Calibration Date : 21-24 JANUARY 2022  
Date of Issue : 25 JANUARY 2022

Calibrated by : Naitakorn Pitsuprasarn

Approved by :   
( Thanakul Petchurai )

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

QF-TS12-04-04-020664



## Continuation of Calibration Certificate

Cert. No. : ACL22059  
Job No. : VC65AC0043  
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	ET-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	ET-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	ETL.BP.05.0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	ETL.BP.03.0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

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).

QH-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22059  
Job No. : VC65AC0043  
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. : ACL22059  
Job No. : VC65AC0043  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.8
Flat	23.7

## 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	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.6	-1.5	-1.5	± 5.0

QH-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22059  
Job No. : VC65AC0043  
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
Eq	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

QH-TS12-04-04-020664



## Continuation of Calibration Certificate

Cert. No. : ACL22059  
Job No. : VC65AC0043  
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	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 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	26.1	0.1	± 1.1
25.0	25.0	0.0	± 1.1

QI-1S12-04-04-02064

T. R. R. R.

## Continuation of Calibration Certificate

Cert. No. : ACL22059  
Job No. : VC65AC0043  
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	128.0	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	136.1	-0.3	± 3.0

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

QI-1S12-04-04-02064

T. R. R. R.

## Continuation of Calibration Certificate

Cert. No. : ACL22059  
Job No. : VC65AC0043  
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## 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

QI-1S12-04-04-02064

T. R. R. R.



## ROTA METER CALIBRATION RESULT OCTOBER 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R <sup>2</sup> )
BKK_FS0577	01 Oct 22	$Y = 1.0202x + 0.1976$	1.0000
BKK_FS0579	01 Oct 22	$Y = 1.0078x + 0.4789$	0.9998
BKK_FS0583	01 Oct 22	$Y = 1.016x + 0.3922$	1.0000
BKK_FS0584	01 Oct 22	$Y = 1.0036x + 2.282$	0.9997
BKK_FS0585	01 Oct 22	$Y = 1.0189x - 5.6476$	0.9997
BKK_FS0586	01 Oct 22	$Y = 1.0095x - 1.1524$	0.9995
BKK_FS0587	01 Oct 22	$Y = 1.013x - 3.6619$	0.9996
BKK_FS0588	01 Oct 22	$Y = 1.0154x + 4.8357$	0.9999
BKK_FS0589	01 Oct 22	$Y = 0.9918x + 4.8069$	0.9999
BKK_FS0590	01 Oct 22	$Y = 1.0038x - 0.4857$	0.9996
BKK_FS0591	01 Oct 22	$Y = 0.9705x - 52.174$	0.9986
BKK_FS0592	01 Oct 22	$Y = 0.9646x - 37.642$	0.9985
BKK_FS0593	01 Oct 22	$Y = 0.9767x - 58.445$	0.9988
BKK_FS0594	01 Oct 22	$Y = 0.9902x - 62.87$	0.9999
BKK_FS0595	01 Oct 22	$Y = 1.0249x - 98.162$	0.9999
BKK_FS0596	01 Oct 22	$Y = 0.9843x - 26.806$	0.9991
BKK_FS0597	01 Oct 22	$Y = 0.9802x - 61.653$	0.9978
BKK_FS1004	01 Oct 22	$Y = 0.9762x + 11.724$	0.9998
BKK_FS1005	01 Oct 22	$Y = 1.0081x + 1.5143$	1.0000
BKK_FS1006	01 Oct 22	$Y = 1.098x - 2.9327$	0.9999
BKK_FS1007	01 Oct 22	$Y = 0.9917x + 1.6592$	1.0000
BKK_FS1008	01 Oct 22	$Y = 1.0132x + 0.7207$	1.0000
BKK_FS1009	01 Oct 22	$Y = 1.0132x + 1.1633$	0.9960
BKK_FS1010	01 Oct 22	$Y = 1.0033x + 0.5758$	0.9999
BKK_FS1011	01 Oct 22	$Y = 1.0234x + 0.1759$	0.9996
BKK_FS1012	01 Oct 22	$Y = 1.0106x - 2.0048$	0.9997
BKK_FS1013	01 Oct 22	$Y = 0.9677x - 35.851$	0.9997
BKK_FS1014	01 Oct 22	$Y = 1.0021x + 0.3148$	0.9998
BKK_FS1015	01 Oct 22	$Y = 0.9994x + 1.786$	1.0000
BKK_FS1016	01 Oct 22	$Y = 1.0105x - 80.256$	0.9998
BKK_FS1017	01 Oct 22	$Y = 0.9995x + 0.649$	1.0000
BKK_FS1018	01 Oct 22	$Y = 1.0011x + 1.1786$	1.0000
BKK_FS1019	01 Oct 22	$Y = 1.0023x - 68.424$	0.9996
BKK_FS1020	01 Oct 22	$Y = 1.0547x - 0.666$	0.9998
BKK_FS1021	01 Oct 22	$Y = 1.018x - 3.3286$	0.9998
BKK_FS1022	01 Oct 22	$Y = 0.9932x - 57.035$	0.9986
BKK_FS1023	01 Oct 22	$Y = 1.0094x + 0.0717$	0.9999
BKK_FS1024	01 Oct 22	$Y = 1.0042x + 0.4086$	0.9997
BKK_FS1025	01 Oct 22	$Y = 1.0132x - 88.507$	0.9996

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ALS Laboratory Group





## ROTA METER CALIBRATION RESULT OCTOBER 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R <sup>2</sup> )
BKK_FS1026	01 Oct 22	$Y = 1.0018x + 1.0776$	0.9997
BKK_FS1027	01 Oct 22	$Y = 1.0053x + 0.231$	0.9995
BKK_FS1028	01 Oct 22	$Y = 0.9792x - 60.312$	0.9982
BKK_FS1029	01 Oct 22	$Y = 0.9935x + 0.8234$	1.0000
BKK_FS1030	01 Oct 22	$Y = 1.0039x + 0.515$	0.9999
BKK_FS1031	01 Oct 22	$Y = 1.009x - 79.295$	0.9998
BKK_FS1039	01 Oct 22	$Y = 0.9967x + 4.5048$	0.9999
BKK_FS1040	01 Oct 22	$Y = 0.9936x + 32.694$	0.9998
BKK_FS1041	01 Oct 22	$Y = 1.067x - 1.999$	1.0000
BKK_FS1042	01 Oct 22	$Y = 1.0019x + 2.1571$	1.0000
BKK_FS1043	01 Oct 22	$Y = 1.1569x - 96.479$	0.8412
BKK_FS1044	01 Oct 22	$Y = 1.0318x - 0.9374$	0.9999
BKK_FS1161	01 Oct 22	$Y = 1.0126x + 0.7738$	0.9999
BKK_FS1162	01 Oct 22	$Y = 0.9994x + 2.6357$	0.9995
BKK_FS1163	01 Oct 22	$Y = 0.977x - 55.03$	0.9987
BKK_FS1164	01 Oct 22	$Y = 0.9914x + 0.8427$	0.9997
BKK_FS1165	01 Oct 22	$Y = 0.9893x + 6.5919$	0.9998
BKK_FS1166	01 Oct 22	$Y = 1.0031x - 77.881$	0.9996
BKK_FS1200	01 Oct 22	$Y = 1.0313x - 0.4602$	0.9995
BKK_FS1201	01 Oct 22	$Y = 1.0045x + 0.15$	0.9996
BKK_FS1202	01 Oct 22	$Y = 0.9702x - 44.156$	0.9994
RYG_FS0197	01 Oct 22	$Y = 1.0039x - 0.179$	0.9999
RYG_FS0198	01 Oct 22	$Y = 0.9984x + 21.757$	1.0000
RYG_FS0199	01 Oct 22	$Y = 1.0577x - 1.7486$	1.0000

Review By:

(Mr. Wichan Choonharat)  
Enviro Field Services Manager

Approved By:

(Mr. Sarayuth Jittrantont)  
Assistant General Manager

## Certificate of System Qualification

GC-OQ

System ID: GC-7  
Organization Name: ALS Laboratory Groups (Thailand) Co., Ltd.  
Organization Location: 104 Phatnakarn 40, Phatnakarn Rd., Suan Luang, Bangkok 10250  
Date: January 27, 2022 4:43:18 PM  
EQP Name: Agilent Recommended  
EQP Revision: GC 02.52  
Overall Qualification Status: Pass

REVIEW BY: Suchada T.  
APPROVED BY: Sarayuth J.  
NEXT CAL DATE: 22 Jul 23

CDS Logon Verification - GC

Logon: suchada

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890

Front SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: -0.1 psi / 5 minutes

Agilent Recommended:  $\geq -2.0$  and  $\leq 0.5$ 

Date: January 27, 2022 4:43:18 PM

System ID: GC-7

## Overall Inlet Pressure Decay Test Status

Pass

## Inlet Pressure Accuracy

Name: 7890  
Front SSL

Setpoint Status: Pass

Setpoint: 25.0 psi  
Actual: 24.9 psi

Accuracy: 0.1 psi

Agilent Recommended:  $\leq 1.2$ 

## Overall Inlet Pressure Accuracy Test Status

Pass

## Inlet Pressure Decay

Name: 7890  
Back SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: -0.1 psi / 5 minutes

Agilent Recommended:  $\geq -2.0$  and  $\leq 0.5$ 

## Overall Inlet Pressure Decay Test Status

Pass

## Inlet Pressure Accuracy

Name: 7890  
Back SSLDate: January 27, 2022 4:43:18 PM  
System ID: GC-7

## Setpoint Status: Pass

Setpoint: Actual

Inlet Pressure: 25.0 psi 25.2 psi

Accuracy: 0.2 psi

Agilent Recommended:  $\leq 1.2$ 

## Overall Inlet Pressure Accuracy Test Status

Pass

## Detector Flow Accuracy

Name: 7890  
Front FID

## Setpoint Status: Pass

Flow Type: Fuel

Setpoint: 30.0 mL/min Measured Flow: 30.8 mL/min

Accuracy: 0.8 mL/min

Agilent Recommended:  $\leq 10.0$  % setpoint ( 3.0 mL/min )

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

## Setpoint Status: Pass

Flow Type: Oxidizer

Setpoint: 400.0 mL/min Measured Flow: 402.2 mL/min

Accuracy: 2.2 mL/min

Agilent Recommended:  $\leq 10.0$  % setpoint ( 40.0 mL/min )

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

## Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 mL/min Measured Flow: 24.2 mL/min

Accuracy: 0.8 mL/min

Agilent Recommended:  $\leq 10.0$  % setpoint ( 2.5 mL/min )

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Date: January 27, 2022 4:43:18 PM  
System ID: GC-7



## Overall Detector Flow Accuracy Test Status

Pass

## Detector Flow Accuracy

Name: 7890  
Back FID

## Setpoint Status:

Pass

## Flow Type:

Fuel

## Setpoint:

30.0 mL/min

## Measured Flow:

30.3 mL/min

## Accuracy:

0.3 mL/min

## Agilent Recommended:

&lt;= 10.0 % setpoint ( 3.0 mL/min )

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

## Setpoint Status:

Pass

## Flow Type:

Oxidizer

## Setpoint:

400.0 mL/min

## Measured Flow:

401.3 mL/min

## Accuracy:

1.3 mL/min

## Agilent Recommended:

&lt;= 10.0 % setpoint ( 40.0 mL/min )

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

## Setpoint Status:

Pass

## Flow Type:

Makeup

## Setpoint:

25.0 mL/min

## Measured Flow:

25.1 mL/min

## Accuracy:

0.1 mL/min

## Agilent Recommended:

&lt;= 10.0 % setpoint ( 2.5 mL/min )

Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

## Overall Detector Flow Accuracy Test Status

Pass

## GC Oven Temperature Accuracy

Name: 7890

Date: January 27, 2022 4:43:18 PM

System ID: GC-7

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## Setpoint Status:

Pass

## Zone:

Oven

## Temperature:

230.0 229.5 °C

## Accuracy:

-0.5 °C

## Agilent Recommended:

&gt;= -1.0 % setpoint in K ( -5.0 °C )

&lt;= 1.0 % setpoint in K ( 5.0 °C )

## Setpoint Status:

Pass

## Zone:

Oven

## Temperature:

100.0 100.9 °C

## Accuracy:

0.9 °C

## Agilent Recommended:

&gt;= -1.0 % setpoint in K ( -3.7 °C )

&lt;= 1.0 % setpoint in K ( 3.7 °C )

## Overall GC Oven Temperature Accuracy Test Status

Pass

## GC Oven Temperature Stability

Name: 7890

## Setpoint Status:

Pass

## Temperature:

100.0 100.7667 °C

## Stability:

0.3 °C

## Agilent Recommended:

&lt;= 0.5 °C

## Overall GC Oven Temperature Stability Test Status

Pass

## Scouting Run

Tested Combination1 Front SSL / Front FID  
Injection Tower

Name: 7890A

Date: January 27, 2022 4:43:18 PM

System ID: GC-7

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## Setpoint Status:

Completed

## Injection Volume on Column:

1.0 uL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: 7890

## Setpoint Status:

Pass

## Base Signal:

13.7 pA

## ASTM Noise

pA

0.05

&lt;= 0.10

## Drift

pA/hr

0.07

&lt;= 2.50

## Agilent Recommended:

## Status:

Pass

## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination1 Front SSL / Front FID

Name: 7890A

## Setpoint Status:

Pass

## Injection Volume on Column:

1.0 uL

## Area RSD:

1.22 %

## Retention Time RSD:

0.15 %

## Agilent Recommended:

&lt;= 3.00

&lt;= 1.00

## Overall Injection Precision Test Status

Pass

## Signal to Noise

Date: January 27, 2022 4:43:18 PM

System ID: GC-7

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Tested Combination1 Front SSL / Front FID  
Injection Tower

Name: 7890

## Setpoint Status:

Pass

## Signal to Noise:

828955

## Agilent Recommended:

&gt;= 300000

## Overall Signal to Noise Test Status

Pass

## Scouting Run

Tested Combination2 Back SSL / Back FID  
Injection Tower

Name: 7890A

## Setpoint Status:

Completed

## Injection Volume on Column:

1.0 uL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: 7890

## Setpoint Status:

Pass

## Base Signal:

12.0 pA

## ASTM Noise

pA

0.07

&lt;= 0.10

## Drift

pA/hr

0.56

&lt;= 2.50

## Agilent Recommended:

## Status:

Pass

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System ID: GC-7

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## Overall Noise and Drift Test Status

Pass

## Injection Precision

## Tested Combination2

Back SSL / Back FID

Name:

7693A

## Setpoint Status:

Pass

Injection Volume on Column:

1.0 uL

Area RSD:

0.46 %

Retention Time RSD:

0.06 %

Agilent Recommended:

≤ 3.00

≤ 1.00

## Overall Injection Precision Test Status

Pass

## Signal to Noise

## Tested Combination2

Back SSL / Back FID

Name:

7690

## Setpoint Status:

Pass

Signal to Noise:

606624

Agilent Recommended:

≥ 300000

## Overall Signal to Noise Test Status

Pass

Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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## Instrument Details

## Purpose

This section describes the as found system configuration.

## Details

## System

System ID	GC-7
Manufacturer	Agilent Technologies
Name	7690
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

## Tested Combination1

Injection Technique	Injection Tower
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No

## Tested Combination2

Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Back
LTM Included?	No

## Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16310209
Firmware Revision	A.11.02
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

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System ID: GC-7

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## Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16310204
Firmware Revision	A.11.02
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

## Sampler 3

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN13440001
Firmware Revision	A.11.03
Vial Heater	Not installed

## Mainframe 1

Manufacturer	Agilent Technologies
Name	7690
Model Number	G3440B
Serial Number	CN16363138
Firmware Revision	B.02.04.2
Component ID/Asset No.	GC-7
Oven Type	Standard

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System ID: GC-7

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## Inlet 1

Manufacturer	Agilent Technologies
Name	7690
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

## Inlet 2

Manufacturer	Agilent Technologies
Name	7690
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

## Detector 1

Manufacturer	Agilent Technologies
Name	7690
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

## Detector 2

Manufacturer	Agilent Technologies
Name	7690
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Date: January 27, 2022 4:43:18 PM  
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## Electronic Signature

### Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

### Details

Full Name of Signer: Tanin-ek Sriwitool  
Logged On User Name: tanin-ek.sriwitool@agilent.com  
Signature Creation Date: January 27, 2022  
Reason for Signature: Executed protocol and published this original version of document

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tanin-ek.sriwitool  
Hostname: ASBKXW007

System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

### GC-QG Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 2:58:28 PM	Audit	Session Created	Session	None
January 27, 2022 2:58:28 PM	Start	Configuration	Session	None
January 27, 2022 2:58:28 PM	Audit	Enrollment	Licensing	User is Pro Engineer and does not require an unlock code
January 27, 2022 3:00:22 PM	Audit	EqLoaded	Session	EQP details for primary technique [G] - File path: Photos\tech\Gai\Conf\gen\kwa02.SI\G162.SI.asp; EQP File Name: [SI:02.SI.asp], EQP Name: [AgilentRecommended]
January 27, 2022 3:06:41 PM	End	Configuration	Session	None
January 27, 2022 4:06:12 PM	End	Configuration	Session	None
January 27, 2022 4:06:18 PM	Start	Qualification	Session	QQ
January 27, 2022 4:06:18 PM	Start	Execution	CD8 Logon Verification - GC - Qualitative Test	None
January 27, 2022 4:04:22 PM	End	Execution	CD8 Logon Verification - GC - Qualitative Test	Run Count: 1
January 27, 2022 4:04:28 PM	Start	Execution	System Inspection and Basic Safety and Operation - T800 - Qualitative Test - No setpoints associated	None
January 27, 2022 4:04:41 PM	End	Execution	System Inspection and Basic Safety and Operation - T800 - Qualitative Test - No setpoints associated	Run Count: 1

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tanin-ek.sriwitool  
Hostname: ASBKXW007

System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

### GC-QG Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:04:43 PM	Start	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
January 27, 2022 4:05:29 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
January 27, 2022 4:05:36 PM	Start	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
January 27, 2022 4:05:51 PM	End	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count: 1
January 27, 2022 4:05:55 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
January 27, 2022 4:06:14 PM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
January 27, 2022 4:06:17 PM	Start	Execution	Inlet Pressure Decay - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
January 27, 2022 4:06:30 PM	End	Execution	Inlet Pressure Decay - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count: 1
January 27, 2022 4:06:32 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tanin-ek.sriwitool  
Hostname: ASBKXW007

System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

### GC-QG Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:05:39 PM	End	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
January 27, 2022 4:06:40 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
January 27, 2022 4:07:18 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
January 27, 2022 4:07:25 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
January 27, 2022 4:07:31 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
January 27, 2022 4:08:07 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
January 27, 2022 4:08:14 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
January 27, 2022 4:08:20 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
January 27, 2022 4:08:37 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
January 27, 2022 4:08:47 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
January 27, 2022 4:08:56 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tatin-ek.sriwirool  
Host Name: ASBKKW007System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

## GC-OQ Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:02:28 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
January 27, 2022 4:09:32 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
January 27, 2022 4:09:34 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
January 27, 2022 4:10:01 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
January 27, 2022 4:10:06 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
January 27, 2022 4:10:08 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
January 27, 2022 4:10:35 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
January 27, 2022 4:10:39 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
January 27, 2022 4:10:42 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
January 27, 2022 4:11:22 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tatin-ek.sriwirool  
Host Name: ASBKKW007System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

## GC-OQ Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:11:29 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
January 27, 2022 4:11:29 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
January 27, 2022 4:12:05 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
January 27, 2022 4:12:07 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
January 27, 2022 4:12:09 PM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: <= 0.5°C	None
January 27, 2022 4:13:38 PM	Audit	Data	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
January 27, 2022 4:13:41 PM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: <= 0.5°C	Run Count: 1
January 27, 2022 4:13:47 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No limits associated	None

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tatin-ek.sriwirool  
Host Name: ASBKKW007System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

## GC-OQ Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:14:45 PM	Audit	Data	GC Scouting Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No limits associated	Data files Path: C:\Users\Public\Documents\GC-7\hem\Scouting\GC2022\SCOUTING 2022-01-27 14-34-42\SCOUT_F_FID\FID1A.ch
January 27, 2022 4:15:05 PM	End	Execution	GC Scouting Run - Injection Tower, Front SSI, Front FID - Part of System Preparation - No limits associated	Run Count: 1
January 27, 2022 4:15:16 PM	Start	Execution	GC Scouting Run - Injection Tower, Back SSI, Back FID - Part of System Preparation - No limits associated	None
January 27, 2022 4:15:26 PM	Audit	Data	GC Scouting Run - Injection Tower, Back SSI, Back FID - Part of System Preparation - No limits associated	Data files Path: C:\Users\Public\Documents\GC-7\hem\Scouting\GC2022\SCOUTING 2022-01-27 14-34-42\SCOUT_B_FID\FID1B.ch
January 27, 2022 4:15:38 PM	End	Execution	GC Scouting Run - Injection Tower, Back SSI, Back FID - Part of System Preparation - No limits associated	Run Count: 1
January 27, 2022 4:15:43 PM	Start	Execution	Noise and Drift - Front FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
January 27, 2022 4:16:20 PM	Audit	Data	Noise and Drift - Front FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path: C:\Users\Public\Documents\GC-7\hem\Scouting\GC2022\NOISEDF 2022-01-27 14-34-51\NOISEDF_F_FID\FID1A.ch

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tatin-ek.sriwirool  
Host Name: ASBKKW007System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

## GC-OQ Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:16:32 PM	End	Execution	Noise and Drift - Front FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count: 1
January 27, 2022 4:16:38 PM	Start	Execution	Noise and Drift - Back FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
January 27, 2022 4:16:56 PM	Audit	Data	Noise and Drift - Back FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path: C:\Users\Public\Documents\GC-7\hem\Scouting\GC2022\NOISEDF 2022-01-27 14-34-51\NOISEDF_B_FID\FID1B.ch
January 27, 2022 4:17:13 PM	End	Execution	Noise and Drift - Back FID - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count: 1
January 27, 2022 4:17:17 PM	Start	Execution	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	None
January 27, 2022 4:18:27 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path: C:\Users\Public\Documents\GC-7\hem\Scouting\GC2022\INPREC 2022-01-27 15-15-51\INPREC_F_FID\FID1A.ch
January 27, 2022 4:18:27 PM	Audit	Data	Injection Precision - Injection Tower, Front SSI, Front FID - GC - L (Area): <= 3.00% - L (Rel. Time): <= 1.00%	Data files Path: C:\Users\Public\Documents\GC-7\hem\Scouting\GC2022\INPREC 2022-01-27 15-15-51\INPREC_F_FID\FID1A.ch

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tashik-ek.sriwattol  
Host Name: ASBK00X007  
System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

GC-OQ Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:19:27 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_F4.D\FID1 A.ch
January 27, 2022 4:19:27 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_F5.D\FID1 A.ch
January 27, 2022 4:19:27 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_F6.D\FID1 A.ch
January 27, 2022 4:19:27 PM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_F7.D\FID1 A.ch
January 27, 2022 4:19:49 PM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Run Count: 1
January 27, 2022 4:20:05 PM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	None

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tashik-ek.sriwattol  
Host Name: ASBK00X007  
System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

GC-OQ Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:20:29 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_B2.D\FID3 B.ch
January 27, 2022 4:20:29 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_B3.D\FID3 B.ch
January 27, 2022 4:20:29 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_B4.D\FID3 B.ch
January 27, 2022 4:20:29 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_B5.D\FID3 B.ch
January 27, 2022 4:20:29 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_B6.D\FID3 B.ch
January 27, 2022 4:20:29 PM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-15-51\NUPRE_B7.D\FID3 B.ch

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tashik-ek.sriwattol  
Host Name: ASBK00X007  
System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

GC-OQ Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:20:45 PM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Run Count: 1
January 27, 2022 4:20:51 PM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L >= 300000	None
January 27, 2022 4:21:18 PM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L >= 300000	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-43-29\OQTON_F1.D\FID1A.ch
January 27, 2022 4:21:33 PM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID - Detector FID - L >= 300000	Run Count: 1
January 27, 2022 4:21:39 PM	Start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L >= 300000	None
January 27, 2022 4:21:50 PM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L >= 300000	Data file Path: C:\Users\Public\Documents\hemStation1\Data\OQ2022\NUPRE 2022-01-27 15-43-29\OQTON_B1.D\FID3B.ch
January 27, 2022 4:22:15 PM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L >= 300000	Run Count: 1
January 27, 2022 4:22:32 PM	End	Qualification	Session	OQ
January 27, 2022 4:22:32 PM	Start	Reporting	Session	None

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7

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User Name: tashik-ek.sriwattol  
Host Name: ASBK00X007  
System ID: GC-7  
Print Date: January 27, 2022 4:43:21 PM

GC-OQ Transaction log:


Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
January 27, 2022 4:37:18 PM	Audit	Reporting	Session	Report Generated: Certificate
January 27, 2022 4:37:47 PM	End	Reporting	Session	None
January 27, 2022 4:37:47 PM	Start	Configuration	Session	None
January 27, 2022 4:37:50 PM	End	Configuration	Session	None
January 27, 2022 4:37:50 PM	Start	Qualification	Session	OQ
January 27, 2022 4:38:41 PM	End	Qualification	Session	OQ
January 27, 2022 4:38:41 PM	Start	Reporting	Session	None
January 27, 2022 4:41:07 PM	Audit	Reporting	Session	Report Generated: Report
January 27, 2022 4:42:06 PM	Audit	Reporting	Session	Report Signed: Report PDF Name: GC-OQ_20220127_OQ Report_1.pdf User Name: tashik-ek.sriwattol@agilent.com Full Name of Signer: Tashik Ek Sritawatol Reason for signature: Executed protocol and published this original version of document

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Date: January 27, 2022 4:43:18 PM  
System ID: GC-7


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**PENTA**  
 CALIBRATION

**PENTA CALIBRATION CO., LTD.**  
 66/124 The Connect 33 Village Kanchanaphisek Road  
 Dokmai Prawet Bangkok 10250  
 Tel: +66 (0) 2069-9773  
 www.pentalcal.com

RYG\_EN0004


 NAC  
 NAC-TS01-TS17023  
 CALIBRATION 0224

## Certificate of Calibration

Represent to Certificate of Calibration PTC/07/22104

Certificate No: PTC/07/22104      Page: 1 of 3  
 Equipment: Digital Balance      Condition: Normal  
 Manufacturer: Sartorius      Serial No: 33108983  
 Model: MSE125P-100-DU      ID No: RYG\_EN0004  
 Type of Balance: Single interval

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


Environment Condition: Temperature 23.9 °C ± 0.3 °C  
 Humidity 58.1 %RH ± 4.4 %RH  
 Air density 1.17 kg/m<sup>3</sup>


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

The Method used: In house method PTC-WH-07, base on Euramet cg 18


Traceability: This certificate is traceable to the SI units through Thai Calibration Service Co., Ltd.  
 NSC-ONSC Accreditation No. Calibration 0189

Date Received: March 23, 2022  
 Calibration Date: March 23, 2022  
 Issued Date: March 25, 2022  
 Calibration By: Mr Rungroj Metakul

  
 (Mr. Khangsak Kallasi)  
 Reviewed by

  
 Approved By  
 (Mr. Keittsak Kerdto)  
 Laboratory Manager

REVIEW BY: Travitak  
 APPROVED BY: [Signature]  
 NEXT CAL. DATE: 09/09/23


**ARCHEMICA**

## Certificate of Calibration


### ICS-2100: Anion (ID#659)

This certificate is to verify that instrument below are calibrated  
by Archemica Lab Co., Ltd.

ICS-2100 S/N: 15010977  
 AS-HV S/N: 5450A36659

For  
**ALS Laboratory Group (Thailand) Co., Ltd.**

Operator Signature: [Signature] Date: Jan 12, 2022  
 (Mr. Thitipong Piromkriput)  
 Applications Chemist


**PENTA**  
 CALIBRATION

**PENTA CALIBRATION CO., LTD.**  
 66/124 The Connect 33 Village Kanchanaphisek Road  
 Dokmai Prawet Bangkok 10250  
 Tel: +66 (0) 2069-9773  
 www.pentalcal.com

Represent to Certificate of Calibration PTC/07/22104

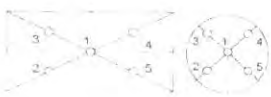
Certificate No: PTC/07/22104      Page: 2 of 3

### Measurement Results:

Without Adjustment

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Position (g)				
1	2	3	4	5
0.0000	-0.0004	-0.0001	0.0000	0.0001
Maximum deviation: 0.0004				

Repeatability Test: Weight to be 1/2 ≤ L ≤ Maximum capacity


Determination of the standard deviation of weighing balance: Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
50	0.00007

Error of indication from nominal value: Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.00000	0.00000	0.00020	2.65
0.01	0.010001	0.01000	0.00000	0.00022	2.17
0.05	0.050002	0.04999	0.00001	0.00022	2.17
0.1	0.099999	0.09999	0.00001	0.00022	2.17
0.5	0.500001	0.50001	0.00001	0.00022	2.17
1	1.000004	0.99999	0.00001	0.00022	2.14
2	1.999999	1.99999	0.00001	0.00022	2.14
5	5.000015	4.99999	0.00002	0.00023	2.14
10	10.000004	10.00000	0.00000	0.00024	2.10
20	20.000029	20.00000	0.00003	0.00032	2.00
50	50.000043	49.99999	0.00005	0.00069	2.00

Note: Weight of adjust (g)


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 66/124 The Connect 33 Village Kanchanaphisek Road  
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 www.pentalcal.com

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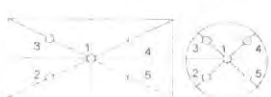
Certificate No: PTC/07/22104      Page: 3 of 3

### Measurement Results:

Without Adjustment

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Position (g)				
1	2	3	4	5
0.0000	0.0000	0.0000	0.0000	0.0000
Maximum deviation: 0.0000				

Repeatability Test: Weight to be 1/2 ≤ L ≤ Maximum capacity

Determination of the standard deviation of weighing balance: Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
100	0.00000

Error of indication from nominal value: Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
65	65.00006	65.0000	0.0001	0.00013	2.00
70	70.00007	70.0000	0.0001	0.00013	2.00
75	75.00009	75.0000	0.0001	0.00014	2.00
80	80.00008	80.0000	0.0001	0.00014	2.00
85	85.00009	85.0000	0.0001	0.00015	2.00
90	90.00010	90.0000	0.0001	0.00015	2.00
95	95.00012	95.0000	0.0001	0.00016	2.00
100	100.00004	100.0000	0.0000	0.00014	2.00
110	110.00004	110.0000	0.0000	0.00015	2.00
120	120.00007	120.0000	0.0001	0.00016	2.00

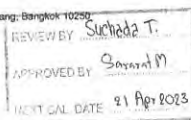
Note: Weight of adjust (g)

The End of Certificate

## Certificate of System Qualification

GC-OQ

System ID: GC-6  
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.  
Organization Location: 104 Phattanakarn Rd., Suan Luang, Bangkok 10250  
Date: October 21, 2021 10:05:40 AM  
EQP Name: Agilent Recommended  
EQP Revision: GC.02.50  
Overall Qualification Status: Pass



## System Inspection and Basic Safety and Operation

Name: 7890  
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status  
Pass

## Inlet Pressure Decay

Name: 7890  
Front SSL  
Setpoint Status: Pass  
Pressure: 25.0 psi  
Pressure Change: 0.0 psi /5 minutes  
Agilent Recommended:  $\geq -2.0$  and  $\leq 0.5$

Overall Inlet Pressure Decay Test Status  
Pass

## Inlet Pressure Accuracy

Name: 7890  
Front SSL

Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

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Setpoint Status: Pass  
Setpoint Actual  
Inlet Pressure: 25.0 psi 24.9 psi  
Accuracy: 0.1 psi  
Agilent Recommended:  $\leq 1.2$

Overall Inlet Pressure Accuracy Test Status  
Pass

## Inlet Pressure Decay

Name: 7890  
Back SSL  
Setpoint Status: Pass  
Pressure: 25.0 psi  
Pressure Change: 0.0 psi /5 minutes  
Agilent Recommended:  $\geq -2.0$  and  $\leq 0.5$

Overall Inlet Pressure Decay Test Status  
Pass

## Inlet Pressure Accuracy

Name: 7890  
Back SSL  
Setpoint Status: Pass  
Setpoint Actual  
Inlet Pressure: 25.0 psi 24.9 psi  
Accuracy: 0.1 psi  
Agilent Recommended:  $\leq 1.2$

Overall Inlet Pressure Accuracy Test Status  
Pass

## Detector Flow Accuracy

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Name: 7890  
Front FID  
Setpoint Status: Pass  
Flow Type: Fuel  
Setpoint: 30.0 mL/min Measured Flow: 30.5 mL/min  
Accuracy: 0.5 mL/min  
Agilent Recommended:  $\leq 10.0$  % setpoint ( 3.0 mL/min )  
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass  
Flow Type: Oxidizer  
Setpoint: 400.0 mL/min Measured Flow: 394.0 mL/min  
Accuracy: 6.0 mL/min  
Agilent Recommended:  $\leq 10.0$  % setpoint ( 40.0 mL/min )  
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass  
Flow Type: Makeup  
Setpoint: 25.0 mL/min Measured Flow: 24.2 mL/min  
Accuracy: 0.8 mL/min  
Agilent Recommended:  $\leq 10.0$  % setpoint ( 2.5 mL/min )  
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status  
Pass

## Detector Flow Accuracy

Name: 7890  
Back FID

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Setpoint Status: Pass  
Flow Type: Fuel  
Setpoint: 30.0 mL/min Measured Flow: 29.1 mL/min  
Accuracy: 0.9 mL/min  
Agilent Recommended:  $\leq 10.0$  % setpoint ( 3.0 mL/min )  
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass  
Flow Type: Oxidizer  
Setpoint: 400.0 mL/min Measured Flow: 397.3 mL/min  
Accuracy: 2.7 mL/min  
Agilent Recommended:  $\leq 10.0$  % setpoint ( 40.0 mL/min )  
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass  
Flow Type: Makeup  
Setpoint: 25.0 mL/min Measured Flow: 24.4 mL/min  
Accuracy: 0.6 mL/min  
Agilent Recommended:  $\leq 10.0$  % setpoint ( 2.5 mL/min )  
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status  
Pass

## GC Oven Temperature Accuracy

Name: 7890

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Setpoint Status: **Pass**  
Zone: Oven  
Setpoint/Actual  
Temperature: 230.0 231.5 °C  
Accuracy: 1.5 °C  
Agilent Recommended:  $\geq -1.0$  % setpoint in K ( -5.0 °C )  
 $\leq 1.0$  % setpoint in K ( 5.0 °C )

Setpoint Status: **Pass**  
Zone: Oven  
Setpoint/Actual  
Temperature: 100.0 100.5 °C  
Accuracy: 0.5 °C  
Agilent Recommended:  $\geq -1.0$  % setpoint in K ( -3.7 °C )  
 $\leq 1.0$  % setpoint in K ( 3.7 °C )

Overall GC Oven Temperature Accuracy Test Status  
Pass

## GC Oven Temperature Stability

Name: 7890  
Setpoint Status: **Pass**  
Setpoint/Average  
Temperature: 100.0 100.4867 °C  
Stability: 0.1 °C  
Agilent Recommended:  $\leq 0.5$

Overall GC Oven Temperature Stability Test Status  
Pass

## Scouting Run

Tested Combination1 Front SSL / Front FID  
Injection Tower  
Name: 7693A

Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

Setpoint Status: **Completed**  
Injection Volume on Column: 1.0  $\mu$ L

Overall Scouting Run Status  
Completed

## Noise and Drift

Tested Combination1 Front SSL / Front FID  
Name: 7890  
Setpoint Status: **Pass**  
Base Signal: 12.7 pA  
ASTM Noise Drift  
pA pA/Hr  
0.06 0.10  
Agilent Recommended:  $\leq 0.10$   $\leq 2.50$   
Status: Pass Pass

## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination1 Front SSL / Front FID  
Name: 7693A  
Setpoint Status: **Pass**  
Injection Volume on Column: 1.0  $\mu$ L  
Area RSD: 0.42 % Retention Time RSD: 0.16 %  
Agilent Recommended:  $\leq 3.00$   $\leq 1.00$

## Overall Injection Precision Test Status

Pass

## Signal to Noise

Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

Tested Combination1 Front SSL / Front FID  
Injection Tower  
Name: 7890  
Setpoint Status: **Pass**  
Signal to Noise: 1174861  
Agilent Recommended:  $\geq 300000$

Overall Signal to Noise Test Status  
Pass

## Scouting Run

Tested Combination2 Back SSL / Back FID  
Injection Tower  
Name: 7693A

Setpoint Status: **Completed**  
Injection Volume on Column: 1.0  $\mu$ L

Overall Scouting Run Status  
Completed

## Noise and Drift

Tested Combination2 Back SSL / Back FID  
Name: 7890  
Setpoint Status: **Pass**  
Base Signal: 10.4 pA  
ASTM Noise Drift  
pA pA/Hr  
0.05 0.00  
Agilent Recommended:  $\leq 0.10$   $\leq 2.50$   
Status: Pass Pass

Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination2 Back SSL / Back FID  
Name: 7693A  
Setpoint Status: **Pass**  
Injection Volume on Column: 1.0  $\mu$ L  
Area RSD: 1.16 % Retention Time RSD: 0.12 %  
Agilent Recommended:  $\leq 3.00$   $\leq 1.00$

## Overall Injection Precision Test Status

Pass

## Signal to Noise

Tested Combination2 Back SSL / Back FID  
Injection Tower  
Name: 7890  
Setpoint Status: **Pass**  
Signal to Noise: 805466  
Agilent Recommended:  $\geq 300000$

## Overall Signal to Noise Test Status

Pass

Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

## Instrument Details

## Purpose

This section describes the as found system configuration.

## Details

## System

System ID	GC-6
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

## Tested Combination1

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

## Tested Combination2

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

## Sampler 1

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN15380030
Firmware Revision	A 11 01
Vali Heater	Not installed

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## Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN10340103
Firmware Revision	A 10 09
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

## Sampler 3

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A 10 09
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

## Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	Version 4.27
Component ID/Asset No.	GC-8
Oven Type	Standard

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## Inlet 1

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

## Inlet 2

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

## Detector 1

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

## Detector 2

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

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## Electronic Signature

## Purpose

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## Details

Full Name of Signer	Suriya Thongkaew
Logged On User Name	suriya.thongkaew@non.agilent.com
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System ID: GC-6

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User Name: surya.thongkiew Hostname: ASDKKW7015		System Id: GC-6 Print Date: October 21, 2021 10:05:46 AM		
OQ GC ALS CN11461066 Transaction log				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 12:18:50 PM	Audit	SessionCreated	Session	None
October 20, 2021 12:18:50 PM	Start	Configuration	Session	None
October 20, 2021 12:18:50 PM	Audit	Enrollment	Licensing	User is Nonpaying and does not require an unlock code
October 20, 2021 12:24:37 PM	Audit	FileLoaded	Session	EQP details for primary technique [C] - File path: [Protocol\Facts\Cur\Config\eqp52 51GC 02 51 eqp] EQP File Name: [GC 02 51 eqp] EQP Name: [AgilentRecommended]
October 20, 2021 12:25:02 PM	End	Configuration	Session	None
October 20, 2021 12:25:08 PM	Start	Qualification	Session	OQ
October 20, 2021 12:25:09 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890 Qualitative Test - No endpoints associated	None
October 20, 2021 12:30:25 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890 Qualitative Test - No endpoints associated	Run Count: 1
October 20, 2021 12:56:29 PM	Start	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= 2.0 psi and <= 0.5 psi	None

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User Name: surya.thongkiew

Hostname: ASDKKW7015

System Id: GC-6

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OQ GC ALS CN11461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 1:02:18 PM	End	Execution	Inlet Pressure Decay - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= 2.0 psi and <= 0.5 psi	Run Count: 1
October 20, 2021 1:02:18 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 20, 2021 1:02:26 PM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
October 20, 2021 1:02:29 PM	Start	Execution	Inlet Pressure Decay - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= 2.0 psi and <= 0.5 psi	None
October 20, 2021 1:04:21 PM	End	Execution	Inlet Pressure Decay - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: >= 2.0 psi and <= 0.5 psi	Run Count: 1
October 20, 2021 1:07:53 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 20, 2021 1:08:11 PM	End	Execution	Inlet Pressure Accuracy - Back SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count: 1
October 20, 2021 1:08:16 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:20:23 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:20:26 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count: 1

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User Name: surya.thongkiew

Hostname: ASDKW7015

System Id: GC-6

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OQ GC ALS CN11461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 1:20:29 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:23:27 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:23:28 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
October 20, 2021 1:23:31 PM	Start	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:27:40 PM	Audit	Data	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:27:43 PM	End	Execution	Detector Flow Accuracy - Front FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
October 20, 2021 1:27:46 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:32:10 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:32:12 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
October 20, 2021 1:32:14 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:34:13 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry

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User Name: surya.thongkiew

Hostname: ASDKW7015

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OQ GC ALS CN11461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 1:34:16 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
October 20, 2021 1:34:40 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:36:33 PM	Audit	Data	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 20, 2021 1:36:36 PM	End	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count: 1
October 20, 2021 1:36:38 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven: S: 230.0°C - L: >= 1.0 AND <= 1.0 % setpoint in K	None
October 20, 2021 2:04:31 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature: Oven: S: 230.0°C - L: >= 1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 20, 2021 2:04:32 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven: S: 230.0°C - L: >= 1.0 AND <= 1.0 % setpoint in K	Run Count: 1
October 20, 2021 2:04:34 PM	Start	Execution	GC Oven Temperature Accuracy - 7890 - Temperature: Oven: S: 100.0°C - L: >= 1.0 AND <= 1.0 % setpoint in K	None
October 20, 2021 2:10:47 PM	Audit	Data	GC Oven Temperature Accuracy - 7890 - Temperature: Oven: S: 100.0°C - L: >= 1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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System ID: GC-6

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User Name: surya.thongkawe  
Hostname: ASBKKW015

System ID: GC-6  
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## OQ GC ALS CN1461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 2:10:49 PM	End	Execution	GC Oven Temperature Accuracy - 7890 - Temperature Oven - 5 100.0°C, L <= 1.0 AND <= 1.0 % segment m.k.	Run Count: 1
October 20, 2021 2:10:51 PM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature Oven - 5 100.0°C, L <= 0.5°C	None
October 20, 2021 2:31:30 PM	Audit	Data	GC Oven Temperature Stability - 7890 - Temperature Oven - 5 100.0°C, L <= 0.5°C	Manual Data Entry
October 20, 2021 2:31:41 PM	End	Execution	GC Oven Temperature Stability - 7890 - Temperature Oven - 5 100.0°C, L <= 0.5°C	Run Count: 1
October 20, 2021 2:31:44 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID Part of System Preparation - No limits associated	None
October 20, 2021 2:43:06 PM	Audit	AccClosed	Session	None
October 21, 2021 9:18:59 AM	Audit	AccRestarted	Session	None
October 21, 2021 9:19:02 AM	Audit	SessionReloaded	Session	None
October 21, 2021 9:19:09 AM	Start	Qualification	Session	OO
October 21, 2021 9:19:09 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID Part of System Preparation - No limits associated	None
October 21, 2021 9:19:41 AM	Audit	AccClosed	Session	None

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Hostname: ASBKKW015

System ID: GC-6  
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## OQ GC ALS CN1461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:20:08 AM	Audit	AccRestarted	Session	None
October 21, 2021 9:20:09 AM	Audit	SessionReloaded	Session	None
October 21, 2021 9:20:13 AM	Start	Qualification	Session	OQ
October 21, 2021 9:20:13 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID Part of System Preparation - No limits associated	None
October 21, 2021 9:29:45 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID Part of System Preparation - No limits associated	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-15-49-01\SCOUT_F001.D\FID1A.ch
October 21, 2021 9:30:05 AM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID Part of System Preparation - No limits associated	Run Count: 1
October 21, 2021 9:30:08 AM	Start	Execution	Noise and Drift - Front FID Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	None
October 21, 2021 9:30:41 AM	Audit	Data	Noise and Drift - Front FID Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-15-49-01\SCOUT_F001.D\FID1A.ch
October 21, 2021 9:31:10 AM	End	Execution	Noise and Drift - Front FID Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	Run Count: 1

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User Name: surya.thongkawe  
Hostname: ASBKKW015

System ID: GC-6  
Print Date: October 21, 2021 10:05:46 AM

## OQ GC ALS CN1461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:31:42 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	None
October 21, 2021 9:32:55 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-16-51-16\NUPREC_F002.D\FID1A.ch
October 21, 2021 9:32:55 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-16-51-16\NUPREC_F003.D\FID1A.ch
October 21, 2021 9:32:58 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-16-51-16\NUPREC_F004.D\FID1A.ch
October 21, 2021 9:32:58 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-16-51-16\NUPREC_F005.D\FID1A.ch
October 21, 2021 9:32:56 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-16-51-16\NUPREC_F006.D\FID1A.ch
October 21, 2021 9:32:56 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-16-51-16\NUPREC_F007.D\FID1A.ch

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Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

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User Name: surya.thongkawe  
Hostname: ASBKKW015

System ID: GC-6  
Print Date: October 21, 2021 10:05:46 AM

## OQ GC ALS CN1461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:33:07 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
October 21, 2021 9:33:23 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID Detector FID - L <= 300000	None
October 21, 2021 9:34:01 AM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID Detector FID - L <= 300000	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-16-51-16\SCOUT_F001.D\FID1A.ch
October 21, 2021 9:34:15 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID Detector FID - L <= 300000	Run Count: 1
October 21, 2021 9:34:19 AM	Start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID Part of System Preparation - No limits associated	None
October 21, 2021 9:35:04 AM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID Part of System Preparation - No limits associated	Data File Path: C:\Chem321\DATA\OQPV20\21OQPV2021_F_2021-10-20-17-13-45\SCOUT_F001.D\FID1A.ch
October 21, 2021 9:35:21 AM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID Part of System Preparation - No limits associated	Run Count: 1
October 21, 2021 9:35:32 AM	Start	Execution	Noise and Drift - Back FID Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	None

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Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

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User Name: suriya.hongkarn  
Host Name: ASBKKW7015  
Print Date: October 21, 2021 10:53:46 AM  
System ID: GC-6

OG GC ALS CN1461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:36:05 AM	Audit	Data	Noise and Drift - Back FID - Detector FID - L (Noise) <= 8.10 pA - L (Drift) <= 2.50 pAhour	Data files Path: C:\Chem321\DATA\OGPV20\2100PV2021_B 2021-10-20 17-13-45\NUPREC_B001.D\FID20.ch
October 21, 2021 9:36:16 AM	End	Execution	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pAhour	Run Count: 1
October 21, 2021 9:36:20 AM	Start	Execution	Injection Precision - Injection Tower: Back SSL, Back FID: GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	None
October 21, 2021 9:36:57 AM	Audit	Data	Injection Precision - Injection Tower: Back SSL, Back FID: GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem321\DATA\OGPV20\2100PV2021_B 2021-10-20 17-13-45\NUPREC_B002.D\FID20.ch
October 21, 2021 9:36:57 AM	Audit	Data	Injection Precision - Injection Tower: Back SSL, Back FID: GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem321\DATA\OGPV20\2100PV2021_B 2021-10-20 17-13-45\NUPREC_B003.D\FID20.ch
October 21, 2021 9:36:57 AM	Audit	Data	Injection Precision - Injection Tower: Back SSL, Back FID: GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem321\DATA\OGPV20\2100PV2021_B 2021-10-20 17-13-45\NUPREC_B004.D\FID20.ch
October 21, 2021 9:36:57 AM	Audit	Data	Injection Precision - Injection Tower: Back SSL, Back FID: GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem321\DATA\OGPV20\2100PV2021_B 2021-10-20 17-13-45\NUPREC_B005.D\FID20.ch

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Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

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User Name: suriya.hongkarn  
Host Name: ASBKKW7015  
Print Date: October 21, 2021 10:55:46 AM  
System ID: GC-6

OG GC ALS CN1461066 Transaction log

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:36:57 AM	Audit	Data	Injection Precision - Injection Tower: Back SSL, Back FID: GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem321\DATA\OGPV20\2100PV2021_B 2021-10-20 17-13-45\NUPREC_B006.D\FID20.ch
October 21, 2021 9:36:57 AM	Audit	Data	Injection Precision - Injection Tower: Back SSL, Back FID: GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Data files Path: C:\Chem321\DATA\OGPV20\2100PV2021_B 2021-10-20 17-13-45\NUPREC_B007.D\FID20.ch
October 21, 2021 9:39:06 AM	End	Execution	Injection Precision - Injection Tower: Back SSL, Back FID: GC - L (Area) <= 3.00% - L (Ret. Time) <= 1.00%	Run Count: 1
October 21, 2021 9:39:11 AM	Start	Execution	Signal to Noise - Injection Tower: Back SSL, Back FID: Detector FID - L >= 300000	None
October 21, 2021 9:39:28 AM	Audit	Data	Signal to Noise - Injection Tower: Back SSL, Back FID: Detector FID - L >= 300000	Data files Path: C:\Chem321\DATA\OGPV20\2100PV2021_B 2021-10-20 17-13-45\NUPREC_B008.D\FID20.ch
October 21, 2021 9:39:39 AM	End	Execution	Signal to Noise - Injection Tower: Back SSL, Back FID: Detector FID - L >= 300000	Run Count: 1
October 21, 2021 9:39:43 AM	End	Qualification	Session	OG
October 21, 2021 9:39:43 AM	Start	Reporting	Session	None
October 21, 2021 10:04:15 AM	Audit	Reporting	Session	Report Generated Certificate

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Date: October 21, 2021 10:05:40 AM  
System ID: GC-6

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## Certificate of System Qualification

ES-OQ

System ID: MY16010005  
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.  
Organization Location: 104 Phatthanakan 40 Phatthanakan Rd., Bangkok 10250

Date: September 13, 2021 5:49:11 PM  
EQP Name: AgilentRecommended  
EQP Revision: ES.02.50  
Overall Qualification Status: Pass

### Preparation

Pass

### Instrument Tests

Pass

### Autosampler Operation

Pass

REVIEW BY: Thirina B.  
APPROVED BY: Suranta N.  
NEXT CAL. DATE: 12 Mar 23

Date: September 13, 2021 5:49:11 PM  
System ID: MY16010005

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BKK\_EL0037

RYG\_EN0038

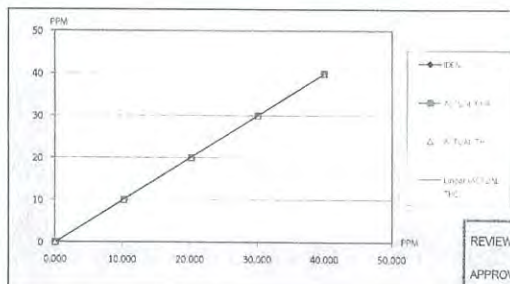


## TEST REPORT

CUSTOMER NAME	ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอสแลบกรุ๊ป จำกัด (มหาชน) (ประเทศไทย))		
EQUIPMENT NAME	THC Analyzer		
MANUFACTURER	HORIBA	MODEL	APHA-37D
SERIAL NO	U439GTHB		
STANDARD GAS CONCENTRATION (PPM)	506.1 PPM	CYLINDER NO	: C754173
CYLINDER PRESSURE (psig)	1,600 PSI	CERTIFIED DATE	12/05/2020
CERTIFIED BY	ARGAS	EXPIRED DATE	12/05/2028

### TEST RESULTS

POINT NO	TEST RESULTS						
	IDEAL	ACTUAL CH4	ERROR CH4	%ERROR CH4	ACTUAL THC	ERROR THC	%ERROR THC
ZERO	0.000	0.000	0.000	0.000	0.000	0.000	-
1	10.000	10.240	0.240	2.40%	10.210	0.210	2.10%
2	20.000	20.230	0.230	1.15%	20.200	0.200	1.00%
3	30.000	30.120	0.120	0.40%	30.170	0.170	0.57%
4	40.000	40.000	0.000	0.00%	40.000	0.000	0.00%
AVERAGE (%)				0.99			0.92



REVIEW BY: Thirina B.  
APPROVED BY: Suranta N.  
NEXT CAL DATE: 14/1/2023

CALIBRATED BY: 31160 Argas  
CHECKED BY: 31160 Argas  
DATE: 14/1/65  
NAC  
PRANATE ASSOCIATES CO., LTD.

สำหรับการสอบเทียบเครื่องมือวัดในห้องปฏิบัติการ: โทร 02-868-0812 หรือ 15,16, E-Mail: Engineer@pranate.com  
วันที่ 14/01/2023 เวลา 10:00 น. สถานที่: ห้องปฏิบัติการวัดค่า THC และ CH4 ที่ ALS Laboratory Group (Thailand) Co., Ltd.

## CHECK LIST

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอส กรุ๊ป จำกัด (มหาชน) จำกัด)  
EQUIPMENT NAME : THC Analyzer  
MANUFACTURER : HORIBA MODEL : APHA-370 SERIAL NO. : U430GTH

### TEST VALUES

NO.	THC Analyzer ( APHA - 370 )	UNIT	BEFORE	AFTER
1	Signal ( CH4 )	mV	29.500	51.300
2	Signal ( THC )	mV	39.200	56.500
3	Detector	Temp °C , Standard Value : Ambient temp ± 15°C to 15°C	47.300	47.400
4	Ambient	Pressure kPa , Standard Value : Ambient / 101.3kPa to 202.6kPa	81.900	81.800
5	Purifier	kPa current atmospheric pressure	101.500	101.400
6	Purifier	°C , Standard Value : 390 °C to 430 °C	420.200	420.300
7	DC 24 V	V , Standard Value : 24 V ± 0.5 V	10.220	10.320
8	DC 5 V	V , Standard Value : 5 V ± 0.5 V	243.000	243.200
9	Bypass (Optional)	L/min , Normal value : 0.9 L/min ± 0.3 L/min	23.900	23.900
10	Over Flow (Optional)	L/min , Standard Value : 0.8 L/min or More	2.900	3.680
11	CH4 Sampling Reading	PPM	0.720	0.230
12	NMHC Sampling Reading	PPM	5.620	5.730
13	THC Sampling Reading	PPM	0.270/32	0.000/0.00
14	Zero Gas CH4/THC	PPM	37.86/37.85	40.0/40.0
15	Span Gas	PPM	20	20
16	Gas H2	20 PSI		

Remark : Reference : EX-EL-017-56 , Ambient HC Monitor APHA 370 Operation Manual Page 181

Remark : ( Ambient temperature = 5°C to 40°C )

อาการที่ตรวจพบ

- Service Maintenance

รายละเอียดการดำเนินการ

ผลการดำเนินการ

- เชื้อเพลิง เครื่องมือ การดำเนินการตรวจวัดได้ตามปกติ

CALIBRATED BY : 75140 ศาสตราจารย์

CHECKED BY : ศาสตราจารย์



DATE : 10/1/19  
DATE : 14/1/19

ข้อมูลจากห้องปฏิบัติการ : เจ้าหน้าที่ : ศาสตราจารย์ / โทร : 02-868-0812 / 1516 / E-Mail : jn@innovative.co.th  
เลขที่ : 03/14-15, 67/35-36 ขยายระยะเวลา 7/71 ถนนพหลโยธิน แขวงจันทบุรี เขตจันทบุรี กรุงเทพมหานคร 10000 โทร 02-868-0812-13 โทรสาร 02-868-0859

FO-EN-207 R00/01-08-13

## Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.  
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan  
Luang, Bangkok 10250

Certificate No : 21-GDM-039

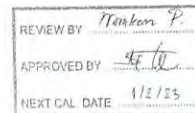
Request No : Req-2021-1004

### Unit Under Calibration Details

Measurement Item : Gas Detection Monitor Resolution : 0.1 (CO) , 1 (CO2)  
Manufacturer : TSI Sensor : 982  
Model : 7575-X-NB Serial Number : Used  
Serial Number : 7575X1825018 Instrument Status : Without Adjustment  
ID : BKK\_FS0933

### Calibration Environment and Details

Temperature : 18 °C to 28 °C  
Humidity : 35 %RH to 65 %RH  
Received Date : 23 July 2021  
Calibration Date : 03 August 2021  
Calibration By : Mr. Sittichok Jirapukdeesakun  
Location of Calibration : LAB 5 Gas meter  
Calibration Procedure : The measurement was done in accordance with CP-GDM-01 by Direct Measurement with Standard Gas



Reference Standard	Model / Lot #	Serial Number	Traceable	Due Calibration
Carbon Monoxide (CO)	9-011-1	-	MESA	25 January 2022
Carbon Dioxide (CO2)	305-401914332-1	-	GASCO	18 September 2024

### Traceability

This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

### Note

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

Calibrated By :

Signature  
Calibration Engineer

Approved By :

Signature  
Mr. Pachi Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 11 August 2021

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

FM-708-GDM-01 Rev 00 Issue date 01/07/19

Certificate No : 21-GDM-039

Request No : Req-2021-1004

Calibration Result : Without Adjustment

Gas Calibration

Gas Calibration	Gas Standard	Before Adjustment		After Adjustment		Uncertainty 95%
		UUC Reading	Error	UUC Reading	Error	
Carbon Dioxide (CO2) ppm	0	0	0	0	0	0.58
	1005	1075	70	1092.5	-2.5	20.07
Carbon Monoxide (CO)	0	0	0	0	0	0.58
	100	103	3	99.95	-0.05	2.09

### Note

- The UUC Reading are average of 4 value  
- Correction = Gas Standard - UUC Reading

End of Certificate

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

FM-708-GDM-01 Rev 00 Issue date 01/07/19

## Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.  
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250

Certificate No : 21-AVM-064

Request No : Req-2021-1004

### Unit Under Calibration Details

Measurement Item : Air Velocity Monitor Resolution : 0.01 (m/s)  
Manufacturer : TSI Probe Model : 962  
Model : 7575-X-NB Probe S/N : P18280029  
Serial Number : 7575X1825018 Instrument Status : Used  
ID : BKK\_FS0933

### Calibration Environment and Details

Temperature : 21 °C ± 2 °C  
Humidity : 55 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 23 July 2021  
Calibration Date : 3 August 2021  
Calibration By : Mr. Sittichok Jirapukdeesakun  
Location of Calibration : LAB 4 Air Velocity

### Calibration Procedure

In-house method CP-ANM-01 based on Comparison technique with Standard Anemometer in Wind Tunnel  
Reference Standard : Manufacturer TSI Wind Tunnel Differential Capacitance Model 220DD-00010A2R, S/N: 014940793 Which was calibrated on 10 September 2020, Calibration Certificate No : MP-0159-19  
Manufacturer TSI, Model 9565-P, S/N: 014940793 Which was calibrated on 23 December 2020, Calibration Certificate No : 551230084004068

### Traceability

This Certificate is traceable to SI Unit through National Institute of Metrology (Thailand) and Metroprocess, ANAB Accreditation No : Calibration AC-1969/20

### Note

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

Calibrated By :

Signature  
Service Calibration Engineer

Approved By :

Signature  
Mr. Pachi Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 11 August 2021

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

FM-708-ANM-01 Rev 00 Issue date 01/07/19



Certificate No : 21-AVM-064  
Request No : Req-2021-1004

Page 2 of 2

Calibration Results : Without Adjustment

Air Velocity Calibration

Calibration Point	Without Adjustment			Adjustment			Uncertainty
	STD Reading	UUC Reading	Error	STD Reading	UUC Reading	Error	
(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(m/s)
0.2	0.20	0.20	0.00	-	-	-	0.015
0.5	0.50	0.50	0.00	-	-	-	0.015
1.0	1.00	1.01	+0.01	-	-	-	0.020
5.0	5.00	4.95	-0.05	-	-	-	0.035
10.0	10.00	9.95	-0.05	-	-	-	0.072
40.0	40.02	39.48	-0.54	-	-	-	0.37

End of Certificate

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

FM-708-ANM-01 Rev.00 Issue date 01/01/19

# Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.  
Address : 104 Soi Phatthanasak 40, Phatthanasak Road, Suan Luang,  
Bangkok 10250

Certificate No : 21-TPM-229  
Request No : Req-2021-1004  
Page : 1/2

## Unit Under Calibration Details

Calibration Parameter : Temperature  
Instrument Name : Digital Thermometer with Sensor  
Manufacturer : TSI  
Model : 7575-X-NB  
Serial Number : 7575X1825018  
Resolution : 0.1 °C  
ID Number : BKK\_FS0933  
Range Calibration : 20 °C to 50 °C  
Type of Sensor : RTD  
Sensor Diameter (mm) : 4.5  
Calibration Position (mm) : 67.5  
Instrument Status : Used

## Calibration Environment and Details

Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 15 %RH  
Received Date : 23 July 2021  
Calibrated Date : 3 August 2021  
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer

## Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11-RTD100, SN: 12000077,  
ID: AR-TPM Which was calibrated on 30 March 2021, Calibration Certificate No. QR21-0719

## Traceability

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No. Calibration 0292

## Note

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

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 18 August 2021

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

FM-708-TPM-01 Rev.01 Issue date 13/02/20

Certificate No : 21-TPM-229  
Request No : Req-2021-1004  
Page : 2/2

## Calibration Note

UUC Adjustment : Not Adjust

## Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
SENSOR 1	20.004	20.3	0.3	0.14
	50.007	49.7	-0.3	0.14

End of Certificate

Calibrated By :   
Mr. Simchok Jirapadeesakul

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

FM-708-TPM-01 Rev.01 Issue date 13/02/20

Page 2 of 2

# Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.  
Address : 104 Soi Phatthanasak 40, Phatthanasak Road, Suan Luang,  
Bangkok 10250

Certificate No : 21-RHM-052  
Request No : Req-2021-1004

## Unit Under Calibration Details

Measurement Item : Relative Humidity Meter  
Manufacturer : TSI  
Model : 7575-X-NB  
Serial Number : 7575X1825018  
ID : BKK\_FS0933  
Resolution : 0.1 (%RH)  
Resolution : -  
Sensor Model : 982  
Sensor S/N : P18260056  
Instrument Status : Used

## Calibration Environment and Details

Temperature : 25 °C ± 5 °C  
Humidity : 55 %RH ± 20 %RH  
Received Date : 23 July 2021  
Calibration Date : 3 August 2021  
Calibration By : Mr. Simchok Jirapadeesakul  
Location of Calibration : LAB 2 Temperature  
Calibration Method : In-house method CP-THM-01 by Comparison With Standard Relative Humidity Meter and Standard Thermometer with RTD Probe in Humidity Temperature Chamber

## Reference Standard

Standard Thermometer Model: GT11, S/N: 12000077, Which was calibration on 30 March 2021, Calibration of Certificate No. QR21-0719 and Relative Humidity Meter, Model: HP23-A, S/N: 61829979, Which was calibration on 28 September 2020, Calibration of Certificate No. QR20-1651

## Traceability

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No. Calibration 0293

## Note

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

Calibrated By :   
Service Calibration Engineer

Approved By :   
Mr. Pacit Mathavorn  
Calibration Engineer Supervisor  
Issue Date : 5 August 2021

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

FM-708-THM-01 Rev.00 Issue date 01/07/19

Certificate No.: 21-RHM-052  
Request No.: Req-2021-1004

Calibration Results : Without Adjustment

Relative Humidity Calibration

Humidity Range (%RH)	Without Adjustment (%RH)			Uncertainty (%RH)
	STD Reading (%RH)	UUC Reading (%RH)	Correction (%RH)	
35	34.38	37.5	3.12	0.9
80	79.05	76.9	-2.15	1.9

End of Certificate

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

IM-708-TM-01 Rev.00 Issue date: 05/07/20



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2717-3000-24 FAX: 0-2715-9484



Certificate of Calibration

Certificate No.: 22PH447  
Page: 1 of 2

Equipment : Lux Meter  
Manufacturer : PEAK METER  
Model : PM6612L  
Serial No.: H12A-D16324  
ID No.: RYG\_FS0536  
Condition As-Received: Used Item  
Received Date: 31 August 2022  
Calibration Date: 02 September 2022

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

Reference: 2208-1093WSC Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %

104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

Procedure used: Calibration were conducted using In-house calibration procedure CP-PH01 by measuring against luminous-intensity standard lamp (source-based method) According to the inverse square law measurement method.

Condition of this result of calibration

1. Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) High-accuracy Irradiance Standard	DL-FEL-U	F-1471	TP-1037-21	18 Oct 2022
2) Photometry & Encoder	LMguide 9.6 m	126RC003	61-140006-1	30 Apr 2023

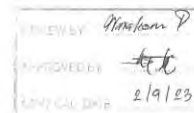
2. This result of calibration was made on requested at the point specified by customer.

3. Test Equipment : Programmable Voltage/Current Source ( Model : OL83A, S/N : 09220284 ).

4. Test Equipment : Illuminance Meter ( Model : 51002, S/N : 090129 ).

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

6. This Certification is traceable to the International System of Unit maintained at:-  
-National Institute of Metrology Thailand (NIMT)



Calibrated by : Nival Nitas  
Issue Date : 06 September 2022

Approved Signatory :  
[ ] Phalinee Prabpaipal  
[ ] Chatchawan Khunpluek  
[x] Nuntawat Khamchai

B 0296366



Cert. No.: 22PH447  
Page: 2 of 2

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

Function : Illuminance Measurement Range : Autorange

Standard Value	Before Adjust UUC* Reading	After Adjust UUC* Reading	Error	Uncertainty
( lx )	( lx )	( lx )	( lx )	( ± lx )
0	0.00	0.00	0.00	0.060
15	-	14.25	-0.75	0.22
100	-	96.5	-3.5	1.5
500	-	492	-8	7.3
1000	881	992	-8	15
2000	-	1986	-14	30
3000	-	2990	-10	45
4000	-	4020	20	59
5000	4550	5060	60	74

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

Before adjustment light source factor setting mode : L0 = 1.058

After adjustment light source factor setting mode : L0 = 1.209

UUC\* = Unit Under Calibration.

-o0o-

a 1124178

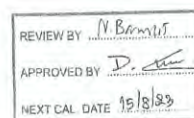


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TEL: 0-2717-3000-24 FAX: 0-2715-9484

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

Certificate of Testing

Equipment : DO Meter  
Manufacturer : YSI  
Model : 5000-115V  
Serial No.: 15E102796  
ID No.: RYG\_EN0032  
Received Date : 11 February 2022  
Test Date : 14 February 2022  
Reference : 2202-0404DSC-4  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.



(Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,  
Rayong 21140, Thailand

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

Tested by : Walalak Sinthean

Approved by :  
[Signature]  
Approved Signatory

( ) Ma'ee Butkruea  
[x] Saithip Meangmai  
( ) Warakorn Lemgagtrakul

Issue Date : 18 February 2022

B 0281285





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

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

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

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

-000-

*Saitthip*

a 1094744



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TEL. 0-2717-3000-27 FAX. 0-2719-9484



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

## Certificate of Calibration

Equipment : DO Meter with Sensor  
Manufacturer : YSI  
Model : 5000-115V  
Serial No. : 15E102796  
ID No. : RYG\_EN0032  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng,  
Rayong 21140, Thailand  
Location : TPA On Site Calibration Laboratory  
Received Order : 11 February 2022  
Calibrated Date : 21 February 2022  
Ambient Temperature : (26 ± 10) °C  
Relative Humidity : (50 ± 30) %  
AC Line Voltage : (220 ± 22) V  
Calibrated by : Kunchit Promprat  
Approved by : *Malee*  
Approved Signatory  
( ) Pornthippa Tameyakul  
(✓) Malee Bulkruea  
( ) Suwit Imjai  
Issue Date : 21 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services

A 0038008



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

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

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

### Condition of this result of calibration

#### 1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1523	2188080	2111273	22 Nov 2022

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

Result of Calibration :- ( \* ) Without Adjustment

Function : Temperature measurement

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

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

UUC\* : Unit Under Calibration

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

-000-

*Malee*

a 1095714



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TEL. 0-2717-3000-27 FAX. 0-2719-9484



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

## Certificate of Calibration

Equipment : Low Temp. Incubator  
Manufacturer : Memmert  
Model : IPP750  
Serial No. : V81B 0084  
ID No. : RYG\_EN0154  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
(Rayong Branch)  
616/10 Moo 5 T. Maenam Khu,  
A. Pluakdaeng, Rayong 21140, Thailand  
BOD Room  
Location :  
Received Order : 22 April 2022  
Calibration Date : 22 April 2022  
Ambient Temperature : (26 ± 10) °C  
Relative Humidity : (50 ± 30) %  
Calibrated by : Man Patanapongpaiboon  
Approved by : *Malee*  
Approved Signatory  
( ) Pornthippa Tameyakul  
(✓) Malee Bulkruea  
( ) Suwit Imjai

REVIEW BY	<i>N. S. S. S.</i>
APPROVED BY	<i>D. S. S. S.</i>
NEXT CAL DATE	21/10/25

Issue Date : 3 May 2022  
The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services

A 0040735

# 1100955





Cert.No.: 22CH405  
Page.: 3 of 3

#### Calibration Results

Function: pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement ( $\pm$ )	Coverage factor k
pH Electrode	4.008	4.010	177.7	0.0046	2.00
S/N.: 1453404	6.982	6.985	3.6	0.0084	2.00
	10.015	10.010	-172.9	0.0073	2.05

Function: Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model: InLab Expert Pro-ISM

- Serial No.: 1453404

Dimension of probe:

- Length: 120 mm.

- Diameter: 12 mm.

- Immersion Depth: 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement ( $\pm$ °C)	Coverage factor k
25.0	25.002	24.9	-0.102	0.13	2.00

Remark: - UUC\* = Unit Under Calibration

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

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a 1100954



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TEL: 0-2717-3600-24 FAX: 0-2719-9484



#### Certificate of Calibration

Certificate No.: 22E986  
Page: 1 of 2

Equipment: pH Meter  
Manufacturer: Mettler Toledo  
Model: SevenCompact S220  
Serial No.: C104059460  
ID No.: RYG\_EN0183

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Condition As-Received: Used Item  
Received Date: 16 March 2022  
Calibration Date: 21 March 2022

Reference: 2203-0611DSC  
Ambient Temperature: ( 23  $\pm$  2 ) °C  
Relative Humidity: ( 50  $\pm$  10 ) %

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

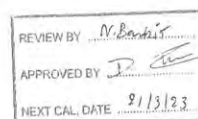
Procedure used: Calibration were conducted using in-house calibration Procedure CP-E17 According to direct measurement method with Multi-Product Calibrator.

#### Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6440007	21E1444	07 May 2022
2) This result of calibration was made on requested at the point specified by customer.				
3) The certificate is valid only to the item calibrated on date and place of calibration.				
4) This Certification is traceable to the International System of Unit maintained at:-				

-National Institute of Metrology Thailand (NIMT)



Calibrated by: Pongsorn Boonysorn  
Issue Date: 22 March 2022

Approved Signatory:

(✓) Phalinee Prabpai  
I Nuntawat Khamchai  
I Pornthippa Taneyakul

K 0284414



Cert.No.: 22E986  
Page.: 2 of 2

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

Function: DC voltage measurement	Range:	2000	mV
Standard Value	UUC* Reading	Error	Uncertainty
( mV )	( mV )	( mV )	( $\pm$ $\mu$ V )
-200.0000	-200.0	0.0	72
-150.0000	-150.0	0.0	69
-100.0000	-100.0	0.0	65
-50.0000	-50.0	0.0	62
0.0000	0.0	0.0	58
50.0000	50.0	0.0	62
100.0000	100.0	0.0	65
150.0000	150.0	0.0	69
200.0000	200.0	0.0	72

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

\*UUC= Unit Under Calibration.

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a 1101070



PENTA  
CALIBRATION

RYG\_EN0002  
PENTA CALIBRATION CO., LTD.  
66/124 The Connect 33 Village Kanchanaphisek Road  
Dokmai, Prawet Bangkok 10250  
Tel: +66 (0) 2069-9773  
www.pentacal.com

#### Certificate of Calibration

Represent to Certificate of Calibration PTC/07/22103

Certificate No: PTC/07/22103 Page: 1 of 2  
Equipment: Digital Balance Condition: Normal  
Manufacturer: Sartorius Serial No: 26707038  
Model: MSE224S-100-DJ ID No: RYG\_EN0002  
Type of Balance: Single interval

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

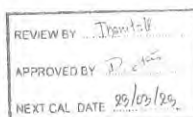
Environment Condition: Temperature: 23.9 °C  $\pm$  0.3 °C  
Humidity: 58.1 %RH  $\pm$  4.4 %RH  
Air density: 1.17 kg/m<sup>3</sup>

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

The Method used: In house method PTC-WI-07, based on Euramet cg 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co., Ltd.  
NSC-ONSC Accreditation No: Calibration 0186

Date Received: March 23, 2022  
Calibration Date: March 23, 2022  
Issued Date: March 25, 2022  
Calibration By: Mr. Rungroj Metakul



Reviewed by  
Mr. Kongsak Kalasin

Approved By  
Mr. Keattisak Kerdin  
Laboratory Manager

This certificate is issued the level of measurement according to the international system of units (SI) in providing traceability of measurement to international standard or other recognized national standard laboratories

This measurement uncertainty related to 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 the Expression of Uncertainty in Measurement (GUM). The effect that this report represents only to the items calibrated

This calibration certificate shall not be reproduced except in full, without written approval from Penta Calibration Co., Ltd.

Represent to Certificate of Calibration :PTC/07/22103

Certificate No. PTC/07/22103

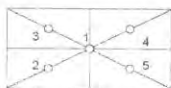
Page 2 of 2

### Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Eccentricity test 100 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0002	0.0002	0.0002
Maximum deviation: 0.0002				

Repeatability Test : Weight to be  $1/2 \leq L \leq$  Maximum capacity

Determination of the standard deviation of weighing balance : Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
200	0.0003

Error of indication from nominal value : Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.000066	2.16
0.01	0.01000	0.0100	0.0000	0.00010	2.06
0.1	0.10000	0.1000	0.0000	0.00010	2.06
1	1.00000	1.0000	0.0000	0.00010	2.06
2	2.00000	1.9999	0.0001	0.00010	2.06
5	5.00001	5.0000	0.0000	0.00010	2.06
10	10.00000	10.0000	0.0000	0.00010	2.06
20	20.00003	19.9999	0.0001	0.00011	2.06
50	50.00004	49.9999	0.0001	0.00012	2.00
100	100.00004	100.0001	-0.0001	0.00017	2.00
200	200.00011	200.0000	0.0001	0.00027	2.06

Note: Weight of adjust (g)

The End of Certificate

PTC/07/22103

RYG\_EN0006



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TEL. 0 2717 3000-27 FAX 0 2719 9484



Cert. No.: 22TM1492  
Page: 1 of 3

### Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UM 400

Serial No. : b495.0899

ID No. : RYG\_EN0006

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

Location : Oven Room

Received Order : 20 October 2022

Calibration Date : 20 October 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hahib

Approved by : Approved Signatory

( ) Ponthippa Tameyakul  
(✓) Malee Butkruea  
( ) Suwit Imjai

Issue Date : 2 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0046805



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2210-03760C-1

Cert. No.: 22TM1492  
Page: 2 of 3

### Procedure Used :-

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

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

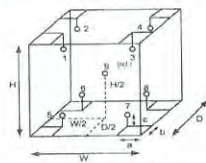
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close



### Probe Installation Details :

Dimension of Chamber :	
a = 5.0 cm	D = 0.33 m
b = 5.0 cm	W = 0.40 m
c = 5.0 cm	H = 0.40 m
	Capacity = 0.053 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL Humid. (%)	43	47
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	18-10RTD-06
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

a 1132473



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2210-03760C-1  
Result of Calibration :- ( ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 22TM1492  
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
70.0	70.0	70.0	0.079	0.47	0.77	0.42	2

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

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

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

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a 1132472





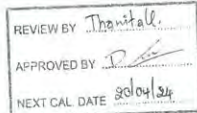
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CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 19, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2717 9000-27 FAX: 0-2719-9884



Cert. No.: 22TM1491  
Page: 1 of 3

## Certificate of Calibration

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNB22  
Serial No. : L513.0648  
ID No. : RYG\_EN0061  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd (Rayong Branch)  
616/10 Moo 5, T. Maenam Khu,  
A. Pluakdaeng,  
Rayong 21140, Thailand  
Location : Wet Chemistry Lab  
Received Order : 20 October 2022  
Calibration Date : 20 October 2022  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Preecha Hahib  
Approved by :   
( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Injai  
Issue Date : 2 November 2022



The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services

A 0046906



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2210-0376OC-4  
Procedure Used :-

Cert. No.: 22TM1491  
Page: 2 of 3

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

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

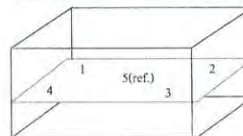
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	24	53	222
Finished of Calibration	24	50	221



Front

Position :	Ref. Std. S/N.:
1	N37P300726
2	N37P300727
3	N37P300728
4	N37P300729
5(ref.)	N37P300730

a 1132471



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2210-0376OC-4  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 22TM1491  
Page: 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
85.0	85.0	85.0	1	2	3	4	5 (ref.)
			84.527	84.563	84.628	84.516	84.580

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
85.0	0.12	0.081	0.18	2

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

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

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

UUC\* : Unit Under Calibration

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

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

-000-

a 1132470



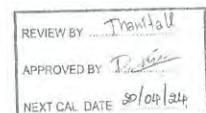
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TEL: 0-2717 9000-27 FAX: 0-2719-9884



Cert. No.: 22TM1517  
Page: 1 of 3

## Certificate of Calibration

Equipment : Hot Air Oven  
Manufacturer : Memmert  
Model : UFE 500  
Serial No. : G511 1572  
ID No. : RYG\_EN0010  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu,  
A. Pluakdaeng,  
Rayong 21140 Thailand  
Location : Oven Room  
Received Order : 20 October 2022  
Calibration Date : 20 October 2022  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Man Pattanapongpaiboon  
Approved by :   
( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Injai  
Issue Date : 2 November 2022



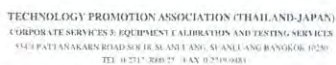
The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services

A 0046908

A 0039308





Cert. No.: 22LM41  
Page.: 1 of 2

## Certificate of Calibration

Equipment :	pH Meter with Sensor
Manufacturer :	Mettler Toledo
Model :	Seven2Go
Serial No. :	B531256371
ID No. :	RYG_FS0420
Submitted by :	<p>ALS Laboratory Group (Thailand) Co Ltd (Rayong Branch) 616/10 Moo 5 T. Maenam Khu. A Phukdaeng Rayong 21140 Thailand</p>
Location :	TPA On Site Calibration Laboratory
Received Order :	11 March 2022
Calibrated Date :	15 March 2022
Ambient Temperature :	( 26 ± 10 ) °C
Relative Humidity :	( 50 ± 30 ) %
AC Line Voltage :	( 220 ± 22 ) V
Calibrated by :	Mahee Buikraua

Calibrated by : Maloo Bulkrusa

Approved by: \_\_\_\_\_  
Approved Signatory

( ) Pornthippa Tameyakul  
(✓) Suwit Imjai

Issue Date 17 March 2022

The Uncertainties are for a confidence probability of approximately 95%

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A 0039307



Equipment : pH Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2203-0495DSC-2  
Procedure Used :-

Cert. No.: 22LM41  
Page.: 2 of 2

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

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1 Reference standard instrument.-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1523	2188080	2111273	22 Nov 2022

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

3 This certification is traceable to the International System of Unit

**Result of Calibration :-** ( \* ) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N: 1311407

Calibration Point ( ° C )	Immersion Depth ( mm )	Standard Temperature ( ° C )	UUC <sup>a</sup> Reading ( ° C )	Error ( ° C )	Uncertainty, ( ± ° C )	Coverage Factor k
25.0	100	25.009	25.4	0.391	0.16	2.00
30.0	100	30.008	30.5	0.492	0.16	2.00
40.0	100	39.997	40.6	0.603	0.16	2.00
50.0	100	48.997	50.6	0.603	0.16	2.00

UUC\* : Unit Under Calibration

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

-ofo-

Grand  
# 1100597

## ภาคผนวก จ

สำเนาหนังสือใบอนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน





ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

กรมโรงงานอุตสาหกรรม  
ถนนพหลโยธิน ๖ เขตราชเทวี  
กรุงเทพมหานคร ๑๐๕๐๐

๒๘ มกราคม ๒๕๖๕

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

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น  
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น  
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๓ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ  
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๕-๙-๔๗๐๑  
ขอพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร  
ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)  
จำกัด คออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑  
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒  
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนไว้ในวิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ น้ำใต้ดิน  
จำนวน ๑๖๒ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช่แล้ว จำนวน ๕๙ รายการ และดิน  
จำนวน ๑๖๒ รายการ รวมทั้งสิ้นจำนวน ๓๓๑ รายการ ตามสิ่งที่ส่งมาด้วย ๓

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

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิระ จันทร์เลิศ)

อธิบดีกรมโรงงานอุตสาหกรรม  
ผู้อำนวยการสำนักงานสิ่งแวดล้อมและเฝ้าระวังมลพิษ  
บุรีธรรมการและสิ่งแวดล้อม กรุงเทพมหานคร

กองวิจัยและเฝ้าระวังมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๕๕๔๖ ๐ ๒๒๐๒ ๕๐๐๒

โทรสาร ๐ ๒๒๕๕ ๓๒๐๘ ๐ ๒๒๕๕ ๓๓๕๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ๖-๒๐๕

ที่ อก ๐๓๑๐(๑)/

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพพร จันทร์ปลั่ง

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๐

๒) นางสาวชัชฌิมา ไกรนารถ ณ นคร

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๑

๓) นายศราวุธ จิตราภรณ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๒

๔) นางสาวกนกกร เอนก

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๓

๕) นายสุริยา สอนแก้ว

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๔

๖) นายวิฑูรย์ ขุนหวัด

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๕

(นายศิระ จันทร์เลิศ)

อธิบดีกรมโรงงานอุตสาหกรรม  
ผู้อำนวยการสำนักงาน  
สิ่งแวดล้อมและเฝ้าระวังมลพิษ  
บุรีธรรมการและสิ่งแวดล้อม กรุงเทพมหานคร

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ๖-๒๐๕

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

๑) นางสาวจิตตา ไชยธรรม

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๖

๒) นางสาววิภา น้อยเสียม

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๗

๓) นางสาวณัฐกาญจน์ อิมขม

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๘

๔) นางสาววันวิมล สายแสง

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๐๙

๕) นางสาวนันทิ สมบูรณ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๐

๖) นางสาววันยา เลี่ยมช้างรงค์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๑

๗) นางสาวสรารัตน์ มงคลจิราวุธ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๒

๘) นางสาวศิริลักษณ์ พึ่งแพง

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๓

๙) นายณพกร จันทะพันธุ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๔

๑๐) นายณเรศ บุญมาก

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๕

๑๑) นายอริยา จิรายุ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๖

๑๒) นางสาวกมลรัตน์ แก้วมัน

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๗

๑๓) นางสาวสุวิมล ชัยเรืองวุฒิ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๘

๑๔) นางสาวสุชาดา ธรรมถาวร

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๑๙

๑๕) นางสาวเมธิกา ชัยเดชอนุกุล

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๐

๑๖) นางสาวศศิธร หนูสวัสดิ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๑

๑๗) นางสาวเสาวลักษณ์ ภูณภาอิพร

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๒

๑๘) นายอภิสิทธิ์ สิงหา

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๓

๑๙) นายศักดิ์สิทธิ์ โพธิ์พิสุทธิ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๔

๒๐) ว่าที่ร้อยตรีหญิง พรนิภา ชำเจริญ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๕

๒๑) นางจิตตา คำแก้ว

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๖

๒๒) นางสาวอรรณพ รักษ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๗

๒๓) นางสาววันรัตน์ แยมกรวาท

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๘

๒๔) นายจุลเดช วรินทร์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๒๙

๒๕) นางสาวดาสุรัตน์ รุ่งคำ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๐

๒๖) นายกร สุขเจริญ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๑

๒๗) นายปัญชา นามเขตต์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๒

๒๘) นายพนม ศรีปิตนนคร

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๓

๒๙) นายอุทิศ อุ่นลิ้ม

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๔

๓๐) ว่าที่ร้อยตรี เลียมเกียรติ อมศรีเสริม

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๕

๓๑) นางสาววิภา สว่างนา

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๖

๓๒) นายอนุพงศ์ วัฒนศิริประเสริฐ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๗

๓๓) นางสาวจุฑารัตน์ ไอนันท์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๘

๓๔) นางสาวจตุรพรรณ พิมพ์สุภาภักดิ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๓๙

(นายศิระ จันทร์เลิศ)

๓๕) นางสาวปรางค์ทิพย์...

อธิบดีกรมโรงงานอุตสาหกรรม  
ผู้อำนวยการสำนักงาน  
สิ่งแวดล้อมและเฝ้าระวังมลพิษ  
บุรีธรรมการและสิ่งแวดล้อม กรุงเทพมหานคร

๓๕) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๐

๓๖) นางสาวเดือนใจ ทางกลาง

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๑

๓๗) นางสาวจิราพร ศิริเวช

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๒

๓๘) นายกรรณ ฤกษ์ชัย

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๓

๓๙) นายทง วีระสัทกิจ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๔

๔๐) นายอนันต์ เจริญ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๕

๔๑) นายคณิศร ชำเพชร

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๖

๔๒) นายอรรถพล นิยมวิทยาพันธ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๗

๔๓) นายภูริช พรหมสมธาส

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๘

๔๔) นายธนเชษฐ์ โภคาพิพัฒน์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๔๙

๔๕) นายชวฤทธิ์ วงษ์จันทร์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๐

๔๖) นายอาทิตย์ ศรีเสน

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๑

๔๗) นายเจตนาถ คงศักดิ์ไทย

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๒

๔๘) นายธีรวิทย์ บุญยั้ง

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๓

๔๙) นายธนนาถ เอนก

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๔

๕๐) นายอภิวัฒน์ ทุมหนู

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๕

๕๑) นางสาวสุภาวีย์ มาก

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๖

๕๒) นางสาวพัชร ขวาลสมบูรณ์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๗

๕๓) นางสาวธิดา บุญเพ็ญ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๘

๕๔) นางสาวกนกกร เจริญเพชร

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๕๙

๕๕) นางสาวพัชรียา หงษ์สมบัติ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๐

๕๖) นางสาวภาณุมาศ สุวงศ์ศรีบุญ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๑

๕๗) นางสาวภาณุมาศ นามวัฒน์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๒

๕๘) นางสาวอุไรรัตน์ พึ่งสำแดง

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๓

๕๙) นายธีรวัฒน์ ปังสุข

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๔

๖๐) นายอิทธิพล ยะโส

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๕

๖๑) นายประพนธ์ วรรณสุขชัย

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๖

๖๒) นายชยธร พงษ์ทิพย์

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๗

๖๓) นางสาวกนกวรรณ จันทร์บาล

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๘

๖๔) นางสาวนภาพร พลิกบุญ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๖๙

๖๕) นายสิทธิโชค ธงเงิน

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๗๐

๖๖) นางสาววรรณใจ บุญ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๗๑

๖๗) นางสาวพรหมธิศา พุ่มกร

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๗๒

๖๘) นางสาวพรทิพย์ ยิ่ง

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๗๓

๖๙) นายณภัทร ศรีวิริยะ

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๗๔

๗๐) นายสุวิชา ทองอ่อน

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๗๕

๗๑) นายวิญญู บุญตะนัย

ทะเบียนเลขที่ ๖-๒๐๕-๙-๔๗๗๖

(นายศิระ จันทร์เลิศ)

๗๒) นายสมบุญ...

อธิบดีกรมโรงงานอุตสาหกรรม  
ผู้อำนวยการสำนักงาน  
สิ่งแวดล้อมและเฝ้าระวังมลพิษ  
บุรีธรรมการและสิ่งแวดล้อม กรุงเทพมหานคร







ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
20	Cyanide	Distillation, Colorimetric Method <sup>(4)</sup>
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
33	Formaldehyde	Distillation, Colorimetric Method <sup>(3)</sup>
34	Free Chlorine	1) DPD Ferrous Titrimetric Method <sup>(4)</sup> 2) Iodometric Method <sup>(4)</sup>
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
37	Hexavalent Chromium	Filtration, Colorimetric Method <sup>(4)</sup>
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
39	Lead	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
40	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/Mass spectrometric Method <sup>(4)</sup>
42	Methiocarb	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>

วิมล  
(นางธิภาณูจน์ อัครสกุลวิไล)  
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.....ศูนย์วิจัยพิษวิทยา

44 Methomyl...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
44	Methomyl	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
45	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method <sup>(4)</sup> 2) Soxhlet Extraction Method <sup>(4)</sup>
47	Oxamyl	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
48	Propoxur	High-Performance Liquid Chromatographic Method <sup>(4)</sup>
49	pH	Electrometric Method <sup>(4)</sup>
50	Phenols	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Distillation, Direct Photometric Method <sup>(4)</sup>
51	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
52	Sulfide	Iodometric Method <sup>(4)</sup>
53	Temperature	Laboratory and Field Methods <sup>(4)</sup>
54	Total Dissolved Solids	Dried at 180 °C <sup>(4)</sup>
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method <sup>(4)</sup>
56	Total Suspended Solids	Dried at 103-105 °C <sup>(4)</sup>
57	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
58	Trivalent Chromium	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>
59	Zinc	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(4)</sup>

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>

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.....ศูนย์วิจัยพิษวิทยา

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>

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.....ศูนย์วิจัยพิษวิทยา

18 Bis(2-ethylhexyl)phthalate...

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>

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.....ศูนย์วิจัยพิษวิทยา

34 Chromium (III)...



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>

วิธีพิมพ์  
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กรมควบคุมมลพิษ

51 cis-1,2-Dichloroethylene...

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>

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กรมควบคุมมลพิษ

68 Fluorene...

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>

วิธีพิมพ์  
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กรมควบคุมมลพิษ

84 Methanol...

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>

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กรมควบคุมมลพิษ

97 Pentachlorophenol...



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>6</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2,4)</sup>
110	TPH (C <sub>7</sub> -C <sub>10</sub> )	Solvent Extraction, Gas Chromatographic Method <sup>(9,21)</sup>
111	TPH (C <sub>11</sub> -C <sub>13</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>

114 1,1,2-Trichloroethane...

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และประเมินสิ่งแวดล้อม

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>

#### ฉลากผลเสีย (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>

3 Carbon Monoxide...

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และประเมินสิ่งแวดล้อม

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>(4)</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>

สิ่งปฏิกูล...

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#### สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,23)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</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>

6 Cadmium...

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และประเมินสิ่งแวดล้อม



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>(1.9.25)</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>(7.15.17)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.16.17)</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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กรมส่งเสริมการค้าระหว่างประเทศ

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	DOE	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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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>
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>

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2) Waste Extraction...

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>(1.6)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(1.9)</sup> 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(20)</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>

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27 Polychlorinated...



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',4,5,5'-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',5,6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1,5,23)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>

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>

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>(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>

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>

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>

26 Carbon tetrachloride...



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