

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Total Suspended Particulate	Console Control Unit	BKK_F50518	12-Jul-22	12-Jan-23	6
Stack	Total Suspended Particulate	Console Control Unit	BKK_F50468	12-Jul-22	12-Jan-23	6
Stack	Total Suspended Particulate	Console Control Unit	BKK_F50556	12-Jul-22	12-Jan-23	6
Stack	Total Suspended Particulate	Console Control Unit	BKK_F50527	12-Jul-22	12-Jan-23	6
Stack	Total Suspended Particulate	Flue gas Analyzer	BKK_F50564	9-Dec-21	9-Dec-22	12
Stack	Total Suspended Particulate	Flue gas Analyzer	RYG_F50565	1-Dec-21	1-Dec-22	12
Stack	Total Suspended Particulate	Flue gas Analyzer	RYG_F50563	9-Dec-21	9-Dec-22	12
Stack	Total Suspended Particulate	Analytical Balance 4 D.	RYG_EN0003	23-Mar-22	23-Mar-23	12
Stack	Carbon Monoxide	Console Control Unit	BKK_F50518	12-Jul-22	12-Jan-23	6
Stack	Carbon Monoxide	Console Control Unit	BKK_F50468	12-Jul-22	12-Jan-23	6
Stack	Carbon Monoxide	Console Control Unit	BKK_F50556	12-Jul-22	12-Jan-23	6
Stack	Carbon Monoxide	Console Control Unit	BKK_F50527	12-Jul-22	12-Jan-23	6
Stack	Carbon Monoxide	Flue gas Analyzer	RYG_F50564	9-Dec-21	9-Dec-22	12
Stack	Carbon Monoxide	Flue gas Analyzer	RYG_F50565	1-Dec-21	1-Dec-22	12
Stack	Carbon Monoxide	Flue gas Analyzer	RYG_F50563	9-Dec-21	9-Dec-22	12
Stack	Carbon Monoxide	CO Analyzer	RYG_EN0034	11-May-22	11-May-23	12
Stack	Oxides of Nitrogen	Console Control Unit	BKK_F50518	12-Jul-22	12-Jan-23	6
Stack	Oxides of Nitrogen	Console Control Unit	BKK_F50468	12-Jul-22	12-Jan-23	6
Stack	Oxides of Nitrogen	Console Control Unit	BKK_F50556	12-Jul-22	12-Jan-23	6
Stack	Oxides of Nitrogen	Console Control Unit	BKK_F50527	12-Jul-22	12-Jan-23	6
Stack	Oxides of Nitrogen	Flue gas Analyzer	RYG_F50564	9-Dec-21	9-Dec-22	12
Stack	Oxides of Nitrogen	Flue gas Analyzer	RYG_F50565	1-Dec-21	1-Dec-22	12
Stack	Oxides of Nitrogen	Flue gas Analyzer	RYG_F50563	9-Dec-21	9-Dec-22	12
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_F50516	21-Sep-21	22-Mar-23	18
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_F50435	9-Apr-21	8-Oct-22	18
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_F50437	21-Sep-21	22-Mar-23	18
Stack	Oxides of Nitrogen	Vacuum Gauge	RYG_F50332	21-Sep-21	22-Mar-23	18
Stack	Oxides of Nitrogen	SPECTROPHOTOMETER	RYG_EN0179	2-Nov-21	2-Nov-22	12
Stack	n-Decane	Console Control Unit	BKK_F50468	12-Jul-22	12-Jan-23	6
Stack	n-Decane	Console Control Unit	BKK_F50556	12-Jul-22	12-Jan-23	6
Stack	n-Decane	Console Control Unit	BKK_F50527	12-Jul-22	12-Jan-23	6
Stack	n-Decane	Flue gas Analyzer	RYG_F50465	19-Jan-22	19-Jan-23	12
Stack	n-Decane	Flue gas Analyzer	RYG_F50563	9-Dec-21	9-Dec-22	12
Stack	n-Decane	Field Rotameter	BKK_FS1004	1-Jul-22	1-Oct-22	3
Stack	n-Decane	GC-FID	BKK_EN0126	21-Oct-21	21-Apr-23	18
Stack	Aluminium	Console Control Unit	BKK_F50468	12-Jul-22	12-Jan-23	6
Stack	Aluminium	Flue gas Analyzer	RYG_F50465	19-Jan-22	19-Jan-23	12
Stack	Aluminium	ICP-OES	BKK_EL0037	13-Sep-21	12-Mar-23	18
Stack	Dioxin and Furan	Console Control Unit	BKK_F50468	12-Jul-22	12-Jan-23	6
Stack	Dioxin and Furan	HRGC/MS	No. 73/2022	14-Feb-22	14-Feb-27	60
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_F50522	1-Jul-22	1-Jan-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	BKK_FS1064	1-Jul-22	1-Jan-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	RYG_F50455	1-Jul-22	1-Jan-23	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	BKK_F50797	1-Jul-22	1-Jan-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_F50251	1-Jul-22	1-Jan-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_F50266	1-Jul-22	1-Jan-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	RYG_F50454	1-Jul-22	1-Jan-23	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	BKK_F50796	1-Jul-22	1-Jan-23	6
Ambient	Total Suspended Particulate	High Volume	RYG_F50175	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_F50292	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_F50393	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_F50291	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	23-Mar-22	23-Mar-23	12
Ambient	Particulate Matter (PM-10)	High Volume	RYG_F50183	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_F50400	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_F50398	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_F50399	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	RYG_EN0001	23-Mar-22	23-Mar-23	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	RYG_F50085	8-Oct-21	8-Apr-23	18

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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Noise	Leq 24 hrs	Sound Calibrator	RYG_F50213	26-Apr-22	26-Apr-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_F50024	4-Oct-21	4-Oct-22	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_F50025	21-Jan-22	21-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_F50026	21-Jan-22	21-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_F50434	21-Jan-22	21-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_F50431	21-Jan-22	21-Jan-23	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_F50216	9-Aug-21	9-Aug-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_F50031	20-Jun-22	20-Jun-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_F50303	11-Jul-22	11-Jul-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_F50437	6-Aug-21	6-Aug-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_F50438	6-Aug-21	6-Aug-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_F50439	6-Aug-21	6-Aug-22	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_F50492	10-Jan-22	10-Jan-23	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_F50213	26-Apr-22	26-Apr-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_F50302	11-Jul-22	11-Jul-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_F50300	21-Jan-22	21-Jan-23	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_F50440	7-Sep-21	7-Sep-22	12
Noise	Noise Dose, TWA	Dose Badge Reader	RYG_F50212	1-Dec-21	1-Dec-22	12
Workplace	Chlorine	Field Rotameter	BKK_F51039	1-Jul-22	1-Oct-22	3
Workplace	Total Dust	Field Rotameter	RYG_F50198	1-Jul-22	1-Oct-22	3
Workplace	Total Dust	Digital Balance	RYG_EN0004	23-Mar-22	23-Mar-23	12
Workplace	Respirable Dust	Field Rotameter	RYG_F50198	1-Jul-22	1-Oct-22	3
Workplace	Respirable Dust	Digital Balance	RYG_EN0004	23-Mar-22	23-Mar-23	12
Workplace	Hydrogen Chloride	Field Rotameter	BKK_F51039	1-Jul-22	1-Oct-22	3
Workplace	Hydrogen Chloride	Ion Chromatography	BKK_EN0069	12-Jan-22	12-Jan-23	12
Workplace	Aluminium	Field Rotameter	RYG_F50198	1-Jul-22	1-Oct-22	3
Workplace	Aluminium	ICP-OES	BKK_EL0037	13-Sep-21	12-Mar-23	18
Workplace	Total VOC	TVOC Analyzer	BKK_F50819	4-Feb-22	5-Aug-23	18
Heat	Heat Stress	Heat Stress Monitor	RYG_F50358	16-Feb-22	16-Feb-23	12
Heat	Heat Stress	Heat Stress Monitor	RYG_F50359	26-Jan-22	26-Jan-23	12
Heat	Heat Stress	Heat Stress Monitor	RYG_F50360	16-Feb-22	16-Feb-23	12
Rayong Lab	pH on site	pH meter	RYG_F50420	14-Mar-22	14-Mar-23	12
Rayong Lab	BOD (5 days at 20°C)	DO meter with Sensor	RYG_EN0032	14-Feb-22	15-Aug-23	12
Rayong Lab	BOD (5 days at 20°C)	Incubator	RYG_EN0154	22-Apr-22	21-Oct-23	12
Rayong Lab	COD	Spectrophotometer	RYG_EN0037	27-Sep-22	27-Mar-24	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Suspended Solids	Hot Air Oven	RYG_EN0010	28-Oct-22	20-Apr-24	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Dissolved Solids 180°C	Hot Air Oven	RYG_EN0010	20-Oct-22	20-Apr-24	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Oil & Grease	Chamber Oven	RYG_EN0006	20-Oct-22	20-Apr-24	18
Rayong Lab	Oil & Grease	Water Bath	RYG_EN0061	20-Oct-22	20-Apr-24	18
Rayong Lab	Fluoride	pH ISE Meter	RYG_EN0183	17-Mar-22	17-Mar-23	12
Water Lab	Hexavalent Chromium	Spectrophotometer	BKK_EN0018	16-Sep-22	16-Sep-23	12

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CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date : 12 Jul 22
 Barometric Pressure (mm.Hg) : 755
 Relative Humidity (%) : 70.0
 Temperature (°C) : 30.0
 Reference Dry Gas Meter Data
 Serial No. : A2003240
 Model No. : DGM-SK25RM-QS8
 Connection Factor (Yr) : 1.0160
 Next Calibration Date : 27 May 23

Reference Dry Gas Meter Data

Calibration No. : C-120722-BKK_F50518
 Dry Gas Meter No. : BKK_F50518
 Console Serial No. : 1504025
 Console Model No. : XC-572-V

ΔH (mm.H ₂ O)	Θ Minutes	Reference Dry Gas Meter Calibration										Console Control - Dry Gas Meter				Dry Gas Meter	
		Vr (Liters)					Tr (°C)					Ti (°C)		To (°C)		Avg.Tm (°C)	
		Initial		Total			Initial		Total			Initial		Total		Correction Factor	
		Final	150.00	0.00	150.00	31.0	Final	150.00	0.00	150.00	29.0	Final	150.00	0.00	150.00	(Y)	ΔAvg.
15	12.41	150.00	150.00	0.00	150.00	31.0	150.00	150.00	0.00	150.00	29.0	150.00	150.00	0.00	150.00	1.0012	47.8864
25	9.38	150.00	150.00	0.00	150.00	31.0	150.00	150.00	0.00	150.00	29.0	150.00	150.00	0.00	150.00	1.0002	45.6070
50	6.61	150.00	150.00	0.00	150.00	31.0	150.00	150.00	0.00	150.00	29.0	150.00	150.00	0.00	150.00	0.9978	45.2959
100	4.65	150.00	150.00	0.00	150.00	32.0	150.00	150.00	0.00	150.00	30.0	150.00	150.00	0.00	150.00	0.9800	44.9789
120	4.17	150.00	150.00	0.00	150.00	32.0	150.00	150.00	0.00	150.00	30.0	150.00	150.00	0.00	150.00	0.9781	45.4066
																Avg.	0.9915

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

ΔAvg. : Offset pressure differential that equates to 21.24 km of air @ 25°C and 760 mm of mercury . mmH₂O : tolerance for individual values ± 5.08 from average .

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

Calibrated by:

Approved by:

(Mr.Tinnakorn Kulchart)
Field Scientist (1)

(Mr.Nattapong Jengwareewong)
Field Specialist(1)



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 12-Jul-22		Ambient Temperature (°C) : 30		
Calibration sheet No. : C-120722-BKK_FS0519		Relative Humidity (%) : 70		
Digital Temperature ID BKK_FS0519		Reference Temperature ID. : BKK_FS1144		
Console Serial No. : 1504025		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	0	0	
	25	25	0	
	50	50	0	
	100	101	1	
	150	153	3	
	200	202	2	
	250	252	2	
	300	302	2	
	500	503	3	
	1000	1004	4	
Probe	1200	1205	5	
	100	101	1	
	125	127	2	
	150	153	3	
Oven	100	101	1	
	125	127	2	
Filter	150	153	3	
	100	101	1	
	125	127	2	
	150	153	3	
Exit	0	0	0	
	10	9	-1	
	20	19	-1	
Meter	0	0	0	
	25	24	-1	
AUX	50	50	0	
	0	0	0	
	25	25	0	
	50	50	0	

Calibrated by:

(Mr.Tinnakorn Kulchart)
Field Scientist (1)

Approved by:

(Mr.Nattapong Jengwareewong)
Field Specialist(1)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0522 Calibration Date : 12 Jul 22
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-120722-BKK_FS0522 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ 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

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P(Std)}{\Delta P(s)}}$$

$$\left[\bar{C}_p(A) - \bar{C}_p(B) \right] \text{ must BE } \leq 0.01$$

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

Calibrated by :  Approved by : 
(Mr.Tinnakorn Kulchart) (Mr.Natthapol Jiengwareewong)
Field Scientist (1) Field Specialist(1)

Form 281-046 (04/03/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0523 Calibration Date : 12 Jul 22
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-120722-BKK_FS0523 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ 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

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P(Std)}{\Delta P(s)}}$$

$$\left[\bar{C}_p(A) - \bar{C}_p(B) \right] \text{ must BE } \leq 0.01$$

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

Calibrated by :  Approved by : 
(Mr.tinnakorn Kulchar) (Mr.Natthapol Jiengwareewong)
Field Scientist (1) Field Specialist(1)

Form 281-046 (04/03/02)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date 12 Jul 22 Nozzle Set ID. : BKK_FS0524
Calibration Sheet No. : C-120722-BKK_FS0524 Vernier Caliper ID. : BKK_FS0626

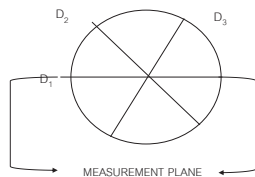
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo ΔD	$(D_1 + D_2 + D_3) / 3$ D_{avg}
	D_1	D_2	D_3		
1	0.318	0.318	0.318	0.000	0.318
2	0.475	0.475	0.475	0.000	0.475
3	0.635	0.635	0.635	0.000	0.635
4	0.792	0.792	0.792	0.000	0.792
5	0.952	0.952	0.952	0.000	0.952
6	1.110	1.110	1.110	0.000	1.110
7	1.270	1.270	1.270	0.000	1.270

Where :

D_1, D_2, D_3 = There 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_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by :  Approved by : 
(Mr.Tinnakorn Kulchart) (Mr.Natthapol Jiengwareewong)
Field Scientist (1) Field Specialist(1)

Form No. QR 281-025 (13/01/03)



CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

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

Reference Dry Gas Meter Data

Serial No. : 1607009
Model No. : SK25EXSR-QC6
Correction Factor(Yr) : 1.0060
Next Calibration Date : 7 Oct 22

Console Control Meter Data

Calibration No. : C-120722-BKK_FS0468
Dry Gas Meter No. : BKK_FS0468
Console Serial No. : 1302005
Console Model No. : XC-572-V

ΔH (mm.H ₂ O)	Θ Minutes	Reference Dry Gas Meter Calibration						Console Control : Drygas Meter						Dry Gas Meter Correction Factor (Y)	Office Calibration Factor (Y)	ΔH_{avg}
		Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)			To (°C)	Avg Tm (°C)			
		Final	Initial	Total		Final	Initial	Total	Final	Initial	Total					
15	12.80	150.00	0.00	150.00	31.0	344.0	191.0	153.00	30.0	30.0	30.0	0.9816	50.7681			
25	9.60	150.00	0.00	150.00	31.0	511.4	368.0	153.40	30.0	30.0	30.0	0.9761	47.6138			
50	6.68	150.00	0.00	150.00	31.0	673.4	520.0	153.40	31.0	31.0	31.0	0.9769	45.9560			
100	4.62	150.00	0.00	150.00	32.0	842.0	689.0	153.00	31.0	31.0	31.0	0.9736	44.2543			
150	3.77	150.00	0.00	150.00	32.0	1005.5	853.0	152.45	32.0	32.0	32.0	0.9756	44.0575			
Avg.														0.9776	46.5339	

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

ΔH_{avg} = Office pressure differential that equates to 21.24 in of air @ 25°C and 760 mm of mercury ; mmH₂O ; tolerance for individual values ± 5.08 from average .


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

Approved by :



(Mr.Natthapol Jiengwareewong)
Field Specialist(1)

Calibrated by :



(Mr.Sakrit Phaisanphrasit)
Field Scientist (4)

ALS-2019-08-01-01-01-01



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	12-Jul-22	Ambient Temperature (°C) :	30
Calibration sheet No. :	C-120722-BKK_FS0469	Relative Humidity (%) :	70
Digital Temperature ID	BKK_FS0469	Reference Temperature ID	BKK_FS0609
Serial No. :	1302005	Serial No. :	7688004
Model :	XC-572-V	Model :	FLUKE 714
		Next Calibrate :	26 Jul 23

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Slack	0	0	0	
	25	24	-1	
	50	49	-1	
	100	98	-2	
	150	148	-2	
	200	197	-3	
	250	247	-3	
	300	297	-3	
	500	497	-3	
	1000	997	-3	
	1200	1197	-3	
Probe	100	99	-1	
	125	124	-1	
	150	149	-1	
Oven	100	99	-1	
	125	124	-1	
	150	149	-1	
Filter	100	100	0	
	125	125	0	
	150	149	-1	
Exit	0	0	0	
	10	11	1	
	20	21	1	
Meter	0	0	0	
	25	25	0	
	50	50	0	
AUX	0	0	0	
	25	25	0	
	50	50	0	

Calibrated by : Saksit Phaisanphisit Approved by : Nattapon Jengwareewong
(Mr.Saksit Phaisanphisit) (Mr.Nattapol Jengwareewong)
Field Scientist (4) Manager

Form 281-048 (02/05/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0472 Calibration Date : 12 Jul 22
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-120722-BKK_FS0472 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm.H ₂ O)	Type s pitot tube (ΔP, mm.H ₂ 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
Cp				0.842	0.842

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P(Std)}{\Delta P(s)}}$$

$$\left| \bar{Cp}_{(A)} - \bar{Cp}_{(B)} \right| \text{ must BE } \leq 0.01$$

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

Calibrated by : Saksit Phaisanphisit Approved by : Nattapon Jengwareewong
(Mr.Saksit Phaisanphisit) (Mr.Nattapol Jengwareewong)
Field Scientist (4) Field Specialist(1)

Form 281-046 (04/03/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0473 Calibration Date : 12 Jul 22
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-120722-BKK_FS0473 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm.H ₂ O)	Type s pitot tube (ΔP, mm.H ₂ 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
Cp				0.842	0.842

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P(Std)}{\Delta P(s)}}$$

$$\left| \bar{Cp}_{(A)} - \bar{Cp}_{(B)} \right| \text{ must BE } \leq 0.01$$

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

Calibrated by : Saksit Phaisanphisit Approved by : Nattapon Jengwareewong
(Mr.Saksit Phaisanphisit) (Mr.Nattapol Jengwareewong)
Field Scientist (4) Field Specialist(1)

Form 281-046 (04/03/02)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date 12 Jul 22 Nozzle Set ID. : BKK_FS0474
Calibration Sheet No. : C-120722-BKK_FS0474 Vernier Caliper ID. : BKK_FS0626

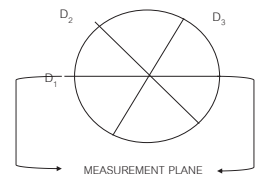
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo ΔD	(D ₁ + D ₂ + D ₃) / 3 D _{avg}
	D ₁	D ₂	D ₃		
1	0.300	0.300	0.300	0.000	0.300
2	0.450	0.450	0.450	0.000	0.450
3	0.600	0.600	0.600	0.000	0.600
4	0.780	0.780	0.780	0.000	0.780
5	0.932	0.932	0.932	0.000	0.932
6	1.094	1.094	1.094	0.000	1.094
7	1.264	1.264	1.264	0.000	1.264

Where :

D₁, D₂, D₃ = There 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_{avg} = (D₁ + D₂ + D₃) / 3



Calibrated by : Saksit Phaisanphisit Approved by : Nattapon Jengwareewong
(Mr.Saksit Phaisanphisit) (Mr.Nattapol Jengwareewong)
Field Scientist (4) Field Specialist(1)

Form No. QS 281-025 (13/01/03)



CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date : 12 Jul 22 Barometric Pressure (mm.Hg) : 755
Next Cal. Date : 12 Jan 23 Relative Humidity (%) : 70.0
Temperature (°C) : 30.0

Console Control Meter Data

Calibration No. : C-120722-BKK_FS0556
Dry Gas Meter No. : BKK_FS0556
Console Serial No. : 1609041
Console Model No. : XC-S72-V
Reference Dry Gas Meter Data
Serial No. : 1607009
Model No. : SK2EXSR-Q06
Correction Factor (Yr) : 1.0060
Next Calibration Date : 7 Oct 22

ΔH (mm.H ₂ O)	Θ Minutes	Reference Dry Gas Meter Calibration						Console Control Dry Gas Meter						Dry Gas Meter Correction Factor (Y)	Office Calibration Factor (Y)	ΔH _g
		Vr (Liters)			Tr (°C)			Vm (Liters)			Avg Im (°C)					
		Final	Initial	Total	Final	Initial	Total	Final	Initial	Total	To	From	Avg			
15	12.58	150.00	0.00	150.00	26.0	1734065.8	1733838.0	1734065.8	1733838.0	147.80	28.0	28.0	28.0	1.0063	47.721	47.721
25	9.67	150.00	0.00	150.00	26.0	1734245.0	1734098.0	1734245.0	1734098.0	147.00	28.0	28.0	28.0	1.0069	47.045	47.045
50	6.78	150.00	0.00	150.00	26.0	1734399.2	1734253.0	1734399.2	1734253.0	146.20	28.0	28.0	28.0	1.0340	46.254	46.254
100	4.68	150.00	0.00	150.00	26.0	1734562.5	1734417.0	1734562.5	1734417.0	145.45	28.0	28.0	28.0	1.0343	44.071	44.071
150	3.82	150.00	0.00	150.00	26.0	1734719.0	1734574.0	1734719.0	1734574.0	145.00	29.0	29.0	29.0	1.0360	43.905	43.905
Avg.														1.0323	45.810	45.810

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

ΔH_g : Office pressure differential that equals to 21.24 in. of air @ 25°C and 760 mm of mercury, mmH₂O; tolerance for individual values ± 5.08 from average.

Procedure: 40 CFR 60, APPA, METH, BEC 5.3 & 7

Calibrated by:

Saksit Phaisanphiset

(Mr.Saksit Phaisanphiset)

Field Scientist (4)

Approved by:

Nattapon Jengwareewong

(Mr.Nattapol Jengwareewong)

Field Specialist (1)

mm Hg, 101.325 kPa, 760.0 mm Hg



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 12-Jul-22		Ambient Temperature (°C) : 30		
Calibration sheet No. : C-120722-BKK_FS0557		Relative Humidity (%) : 70		
Digital Temperature ID BKK_FS0557		Reference Temperature ID: BKK_FS0609		
Console Serial No. : 1606041		Serial No. : 7688004		
Console Model : XC-S72-V		Model : FLUKE 714		
		Next Calibrate : 26 Jul 23		
Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	1	1	
	25	26	1	
	50	51	1	
	100	102	2	
	150	153	3	
	200	202	2	
	250	251	1	
	300	302	2	
	500	503	3	
	1000	1001	1	
Probe	1200	1201	1	
	100	102	2	
	125	128	3	
	150	153	3	
	100	102	2	
Oven	125	128	3	
	150	153	3	
	100	102	2	
Filter	125	128	3	
	150	153	3	
Exit	0	1	1	
	10	11	1	
	20	20	0	
Meter	0	1	1	
	25	26	1	
	50	51	1	
AUX	0	1	1	
	25	26	1	
	50	51	1	

Calibrated by

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(Mr.Saksit Phaisanphiset)

Field Scientist (4)

Approved by

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Field Specialist(1)

Form 281-048 (02/03/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0561 Calibration Date : 12 Jul 22
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-120722-BKK_FS0561 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm.H ₂ O)	Type s pitot tube (ΔP, mm.H ₂ 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
Cp				0.842	0.842

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P_{(std)}}{\Delta P_{(s)}}}$$

$$| \bar{Cp}_{(A)} - \bar{Cp}_{(B)} | \text{ must BE } \leq 0.01$$
$$\sum_{i=1}^3 [Cp_{(s)} - Cp_{(A \text{ or } B)}]$$

$$\text{Average deviation(A or B)} = \frac{\sum_{i=1}^3 [Cp_{(s)} - Cp_{(A \text{ or } B)}]}{3} \text{ must BE } \leq 0.01$$

Calibrated by

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(Mr.Saksit Phaisanphiset)

Field Scientist (4)

Approved by

Nattapon Jengwareewong

(Mr.Nattapol Jengwareewong)

Field Specialist(1)

Form 281-046 (04/03/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0560 Calibration Date : 12 Jul 22
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-120722-BKK_FS0560 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm.H ₂ O)	Type s pitot tube (ΔP, mm.H ₂ 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
Cp				0.842	0.842

$$Cp(S) = Cp_{std} \sqrt{\frac{\Delta P_{(std)}}{\Delta P_{(s)}}}$$

$$| \bar{Cp}_{(A)} - \bar{Cp}_{(B)} | \text{ must BE } \leq 0.01$$
$$\sum_{i=1}^3 [Cp_{(s)} - Cp_{(A \text{ or } B)}]$$

$$\text{Average deviation(A or B)} = \frac{\sum_{i=1}^3 [Cp_{(s)} - Cp_{(A \text{ or } B)}]}{3} \text{ must BE } \leq 0.01$$

Calibrated by

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(Mr.Saksit Phaisanphiset)

Field Scientist (4)

Approved by

Nattapon Jengwareewong

(Mr.Nattapol Jengwareewong)

Field Specialist(1)

Form 281-046 (04/03/02)



PROBE NOZZLE DIAMETER
CALIBRATION DATA SHEET

Calibration Date	12 Jul 22	Nozzle Set ID.:	BKK_FS0562
Calibration Sheet No.:	C-120722-BKK_FS0562	Vernier Caliper ID.:	BKK_FS0626

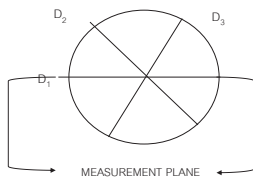
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo ΔD	$(D_1 + D_2 + D_3) / 3$ D_{avg}
	D_1	D_2	D_3		
1	0.300	0.306	0.302	0.006	0.303
2	0.480	0.475	0.480	0.005	0.478
3	0.625	0.630	0.630	0.005	0.628
4	0.755	0.750	0.765	0.015	0.757
5	0.975	0.980	0.970	0.010	0.975
6	1.095	1.090	1.095	0.005	1.093
7	1.275	1.275	1.270	0.005	1.273
8	1.610	1.610	1.610	0.000	1.610

Where :

D_1, D_2, D_3 = There 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_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by

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Nattapon Jengwareewong

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Field Specialist(1)

Form No. QF 281-025 (13/01/03)

CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

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

Reference Dry Gas Meter Data

Serial No. : 1607009
Model No. : SK2EXSR-QC6
Correction Factor (Yr) : 1.0060
Next Calibration Date : 7 Oct 22

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

Console Control Meter Data

Calibration No. : C-120722-BKK_FS0527
Dry Gas Meter No. : BKK_FS0527
Serial No. : 1508053
Model No. : XC-572V



ΔH (mm.H ₂ O)	Θ Minutes	Reference Dry Gas Meter Calibration				Console Control : Drygas Meter						Dry Gas Meter Correction Factor (Y)	Office Calibration Factor (Y)	ΔH_0
		Vr (Liters)		Tr (°C)		Vm (Liters)		Ti (°C)		Avg.Tm (°C)				
		Final	Initial	Total		Final	Initial	Total						
15	11.28	150.00	0.00	150.00	30.0	264.868.6	264.222.0	146.60	30.0	30.0	1.0276	38.1600		
25	8.63	150.00	0.00	150.00	31.0	264.526.8	264.380.0	146.80	31.0	31.0	1.0254	40.1466		
50	6.32	150.00	0.00	150.00	31.0	264.485.2	264.539.0	146.20	31.0	31.0	1.0271	41.1361		
100	4.45	150.00	0.00	150.00	31.0	264.445.0	264.699.0	146.00	31.0	31.0	1.0236	40.7887		
150	3.67	150.00	0.00	150.00	31.0	266.059.0	264.612.0	147.00	31.0	31.0	1.0118	41.6143		
										Avg.		1.0232	40.5743	

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

ΔH_0 : Office pressure differential that equates to 21.24 in of air @ 25 C and 760 mm of mercury, mmH₂O : tolerance for individual value ± 5.08 from average.

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

Calibrated by

Saksit Phaisanphiset

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(Mr.Nattapol Jengwareewong)

Field Scientist(4)

Field Specialist(1)

FORM NO. 1 06-024 REVISION NO. 1 ISSUE DATE 9/1/19



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	12 Jul 22	Ambient Temperature (C°) :	30
Calibration sheet No. :	C-120722-BKK_FS0528	Relative Humidity (%) :	70
Digital Temperature ID	BKK_FS0508	Reference Temperature ID.:	BKK_FS0609
Console Serial No.:	1503017	Serial No.:	7688004
Console Model:	XC-572-V	Model:	FLUKE 714
		Next Calibrate :	26 Jul 23

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	2	2	
	25	24	-1	
	50	51	1	
	100	103	3	
	150	151	1	
	200	202	2	
	250	251	1	
	300	301	1	
	500	503	3	
	1000	1001	1	
Probe	1200	1202	2	
	100	101	1	
	125	126	1	
	150	153	3	
Oven	100	101	1	
	125	126	1	
	150	151	1	
Filter	100	102	2	
	125	125	0	
	150	152	2	
Exit	0	0	0	
	10	10	0	
	20	20	0	
Meter	0	0	0	
	25	25	0	
	50	50	0	
AUX	0	0	0	
	25	25	0	
	50	50	0	

Calibrated by

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(Mr.Saksit Phaisanphiset)

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(Mr.Nattapol Jengwareewong)

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Form 281-048 (02/05/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0531 Calibration Date : 12 Jul 22
Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
Calibration Sheet No. : C-120722-BKK_FS0531 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ 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

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

$$C_p(A) - C_p(B) \text{ must BE } \leq 0.01$$

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

Calibrated by

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(Mr.Saksit Phaisanphiset)

Field Scientist (4)

Approved by

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(Mr.Nattapol Jengwareewong)

Field Specialist(1)

Form 281-046 (04/03/02)



Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK_FS0532 Calibration Date : 12 Jul 22
 Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK_FS0441
 Calibration Sheet No. : C-120722-BKK_FS0532 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP , mm.H ₂ O)	Type s pitot tube (ΔP , mm.H ₂ 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

$$C_p(s) = C_{p_{avg}} \sqrt{\frac{\Delta P(s)}{\Delta P(s)}}$$

$$\left[\bar{C}_{p(A)} - \bar{C}_{p(B)} \right] \text{ must be } \leq 0.01$$

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

Calibrated by : Saksit Phaisanphisit

(Mr.Saksit Phaisanphisit)

Field Scientist (4)

Approved by : Nattapon Jengwareewong

(Mr.Nattapon Jengwareewong)

Field Specialist(1)

Form 281-046 (04/03/02)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date 12 Jul 22 Nozzle Set ID. : BKK_FS0533
 Calibration Sheet No. : C-120722-BKK_FS0533 Vernier Caliper ID. : BKK_FS0626

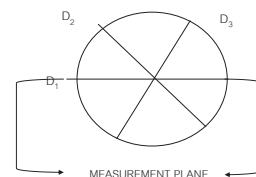
Nozzle ID #	Nozzle Diameter (mm.)			Hi - Lo ΔD	$(D_1 + D_2 + D_3) / 3$ D_{avg}
	D_1	D_2	D_3		
1	0.318	0.318	0.318	0.000	0.318
2	0.475	0.475	0.475	0.000	0.475
3	0.635	0.635	0.635	0.000	0.635
4	0.792	0.792	0.792	0.000	0.792
5	0.952	0.952	0.952	0.000	0.952
6	1.110	1.110	1.110	0.000	1.110
7	1.270	1.270	1.270	0.000	1.270

Where :

D_1, D_2, D_3 = There 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_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by : Saksit Phaisanphisit

(Mr.Saksit Phaisanphisit)

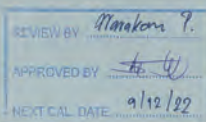
Field Scientist (4)

Approved by : Nattapon Jengwareewong

(Mr.Nattapon Jengwareewong)

Field Specialist(1)

Form No. QS 281-025 (13/01/03)



testo

Calibration certificate Kalibrier-Zertifikat

4319339

Object Gegenstand: Controlunit 1350 Measuring Box testo 350
 Manufacturer Hersteller: TESTO SE & Co. KGaA TESTO SE & Co. KGaA
 Type description Typ: 0632 3511 0632 3510
 Serial no. Serien Nr.: 03580182 62985049
 Inventory no. Inventar Nr.: --- ---
 Test equipment no. Prüfmittel Nr.: --- ---
 Equipment no. Equipment Nr.: 14672444 14674793
 Location Standort: --- ---
 Customer Auftraggeber: ALS Laboratory Group (Thailand) Co., Ltd Eastern Seaboard Industrial Estate TH-21140 A. Phakdaeng, Rayong, Thailand
 Customer ID no. Kunden Nr.: 1031994
 Order no. Auftrags Nr.: 10642828 / 0520 0055
 Date of calibration Datum der Kalibrierung: 09.12.2021
 Date of the recommended re-calibration Datum der empfohlenen Rekalibrierung: 09.12.2022

Hereby we confirm that the performing calibration laboratory is working with a management system according to ISO 9001:2015 and ISO/IEC 17025:2018. Accreditation certificates can be found under www.testo.de. The measuring installations used for calibration are regularly calibrated and traceable to the national standards of the German Federal Physical Technical Institute (PTB) or other national standards. Should no national standards exist, the measuring procedure corresponds with the technical regulations and norms valid at the time of the measurement. The documents established for this procedure are available for viewing. All the necessary measured data can be found on this calibration certificate.

Hiermit bestätigen wir, dass das durchführende Kalibrierlabor ein Managementsystem nach ISO 9001:2015, sowie ISO/IEC 17025:2018 eingeführt hat. Die Urkunden finden Sie auf www.testo.de. Die für die Kalibrierung verwendeten Mess-einrichtungen werden regelmäßig kalibriert und sind rückführbar auf die nationalen Normale der Physikalisch-Technischen Bundesanstalt (PTB) Deutschlands oder auf andere nationale Normale. Wo keine nationalen Normale existieren, entspricht das Messverfahren den derzeit gültigen technischen Regeln und Normen. Die für diesen Vorgang angefertigte Dokumentation kann eingesehen werden. Alle erforderlichen Messdaten sind in diesem Kalibrier-Zertifikat aufgelistet.

Conformity statement Konformitätsaussage

☒ Measured value(s) within the allowable deviation¹⁾, Messwert(e) innerhalb der zulässigen Abweichung¹⁾.
☐ Measured value(s) outside of the allowable deviation¹⁾, Messwert(e) außerhalb der zulässigen Abweichung¹⁾.

¹⁾ The expanded measurement uncertainty was calculated according to EA-4-02:2013 with a coverage probability of approx. 95% and contains the uncertainty of the reference, the method and the uncertainty of the unit under test. The statement of conformity is based on the decision rule "Vertrauensniveau 50" (confidence level 50).

²⁾ Die erweiterte Messunsicherheit wurde nach EA-4-02:2013 mit einer Überdeckungswahrscheinlichkeit von etwa 95% berechnet und enthält die Unsicherheit der Referenz, des Verfahrens sowie die Unsicherheit des Prüflings. Die Konformitätsaussage erfolgt nach der Entscheidungsregel "Vertrauensniveau 50".

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Supervisor Fachverantwortlicher

Martin Förderer

Technician Bearbeiter

Johannes Wängler

Testo Industrial Services GmbH

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Calibration certificate Kalibrier-Zertifikat

4319339

Measuring equipment Messeinrichtungen

Reference	Traceability	Next cal.	Certificate-no.	Eq.-no.
Referenz	Rückführung	Rekal.	Zertifikat-Nr.	Eq.-Nr.
a. Test gas medium 1 Proflgas Medium 1	SCS-SCS0026 2021-03	2024-03	4017586	12899916
b. Test gas medium 3 Proflgas Medium 3	SCS-SCS0026 2021-03	2024-03	4017586	12899916
c. Test gas medium 5 Proflgas Medium 5	SCS-SCS0026 2021-03	2024-03	4017591	12899916
d. Test gas medium 8 Proflgas Medium 8	SCS-SCS 2021-07	2022-10	4229471	12899917
e. Test gas medium 7 Proflgas Medium 7	SCS-SCS0026 2021-03	2022-03	4017596	12899916
f. Test gas medium 11 Proflgas Medium 11	ISO-ISO 8141 2021-04	2022-04	4017600	14087984
g. Digistart 4420 Digistart 4420	15070-01-01 2021-07	2022-07	E166673	12969901
h. i. Pneumator Rheometer	15070-01-01 2021-07	2022-07	043618	12969917

Reference certificates are available at www.primasonline.com Referenzzertifikate sind auf www.primasonline.com abrufbar.

Ambient conditions Umgebungsbedingungen

Temperature Temperatur (20...26) °C Humidity Feuchte (20...60) % RH % rF

Measuring procedure Messverfahren

The calibration was carried out by comparison measurement with calibrated test gases, a calibrator of temperature and pressure. Die Kalibrierung erfolgte durch Vergleichsmessung mit kalibrierten Prüfgasen, einem Temperatur- und Druckkalibrator.

Measuring results Messergebnisse

Channel Kanal ---

Unit Einheit	Reference value Bezugswert	Indicated measured value probe Angezeigter Messwert Kalibriergegenstand	Deviation Abweichung	Allowed deviation ¹⁾ Zulässige Abweichung ¹⁾	Measurement uncertainty (k=2) Messunsicherheit (k=2)	Confirmation Bewertung
CO						
ppm	100.1 ^a	104	3.9	± 11	3.3	pass
ppm	401.0 ^b	404	3.0	± 21	8.5	pass
ppm	700.0 ^c	729	29.0	± 36	14.4	pass
NO						
ppm	150.3 ^a	151	0.7	± 9	4.0	pass
ppm	300 ^d	301	1	± 16	6.9	pass
NO2						
ppm	99.9 ^a	102.3	2.4	± 5.1	3.20	pass
SO2						
ppm	100.1 ^f	97	-3.1	± 6	3.5	pass
O2						
Vol.-%	0.0 ^a	0.04	0.0	± 0.21	0.027	pass
Vol.-%	2.510 ^a	2.54	0.030	± 0.21	0.055	pass
Vol.-%	5.000 ^b	5.06	0.060	± 0.21	0.102	pass
Temperatur						
°C	100.0 ^a	99.1	-0.9	± 1.1	0.24	pass
°C	200.0 ^a	199.9	-0.1	± 1.1	0.24	pass
Druck						
hPa	50.0 ^a	50.0	0.0	± 0.9	0.52	pass
hPa	100.0 ^a	100.0	0.0	± 1.6	0.52	pass

^{a)} in accordance with the manufacturer gemäß Hersteller

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Calibration certificate Kalibrier-Zertifikat

4319339

Special remarks Besondere Bemerkungen

Kalibrier-Zertifikat Calibration certificate

4308414

Gegenstand Object: testo 340
 Hersteller Manufacturer: TESTO SE & Co. KGaA
 Typ Type description: 0632 3340
 Serien Nr. Serial no.: 63119028
 Inventar Nr. Inventory no.: ---
 Prüfmittel Nr. Test equipment no.: ---
 Equipment no.: 14668874
 Standort Location: ---



Hiermit bestätigen wir, dass das durchführende Kalibrierlabor ein Managementsystem nach ISO 9001:2015, sowie ISO/IEC 17025:2018 eingeführt hat. Die Untereinheiten werden regelmäßig kalibriert und sind rückführbar auf die nationalen Normale der Physikalisch-Technischen Bundesanstalt (PTB) Deutschlands oder auf andere nationale Normale. Wo keine nationalen Normale existieren, entspricht das Messverfahren den derzeit gültigen technischen Regeln und Normen. Die für diesen Vorgang angefertigte Dokumentation kann eingesehen werden. Alle erforderlichen Messdaten sind in diesem Kalibrier-Zertifikat aufgelistet.

Hereby we confirm that the performing calibration laboratory is working with a management system according to ISO 9001:2015 and ISO/IEC 17025:2018. Accreditation certificates can be found under www.testo.de. The measuring installations used for calibration are regularly calibrated and traceable to the national standards of the German Federal Physical Technical Institute (PTB) or other national standards. Should no national standards exist, the measuring procedure corresponds with the technical regulations and norms valid at the time of the measurement. The documents established for this procedure are available for viewing. All the necessary measured data can be found on this calibration certificate.

Auftraggeber Customer: ALS Laboratory Group (Thailand) Co., Ltd
 Eastern Seaboard Industrial Estate, 64/7
 DE-21140 Plaukdaeng Rayong Thailand

Kunden Nr. Customer ID no.: 1031994

Auftrags Nr. Order no.: 10842886 / 0520 0055

Datum der Kalibrierung Date of calibration: 01.12.2021

Datum der empfohlenen Rekalibrierung Date of the recommended re-calibration: 01.12.2022

Konformitätsaussage Conformity statement

- ☒ Messwert(e) innerhalb der zulässigen Abweichung¹. Measured value(s) within the allowable deviation¹.
☐ Messwert(e) außerhalb der zulässigen Abweichung¹. Measured value(s) outside of the allowable deviation¹.

¹ Die erweiterte Messunsicherheit wurde nach EA-4-02 M:2013 mit einer Überdeckungswahrscheinlichkeit von etwa 95% berechnet und enthält die Unsicherheit der Referenz, des Verfahrens sowie die Unsicherheit des Prüflings. Die Konformitätsaussage erfolgt nach der Entscheidungsregel "Vertrauensniveau 50".
² The expanded measurement uncertainty was calculated according to EA-4-02 M:2013 with a coverage probability of approx. 95% and contains the uncertainty of the reference, the method and the uncertainty of the unit under test. The statement of conformity is based on the decision rule "Vertrauensniveau 50" (confidence level 50%).

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Stempel Seal



Fachverantwortlicher Supervisor

[Signature]
 Martin Förderer

Bearbeiter Technician

Cosima Link
 Cosima Link

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Kalibrier-Zertifikat Calibration certificate

4308414

Messseinrichtungen Measuring equipment

Index	Referenz Reference	Rückführung Traceability	Reikal. Next cal.	Zertifikat-Nr. Certificate no.	Eq.-Nr. Eq. no.
a	Prüfgas Medium 1 Test gas medium 1	SCS-SCS0028 2021-03	2024-03	4017585	12899976
b	Prüfgas Medium 3 Test gas medium 3	SCS-SCS0028 2021-03	2024-03	4017588	12899982
c	Prüfgas Medium 8 Test gas medium 8	SCS-SCS0028 2021-03	2024-03	4017591	12899984
d	Prüfgas Medium 8 Test gas medium 8	SCS-SCS 2021-07	2022-10	4180461	12899987
e	Prüfgas Medium 11 Test gas medium 11	ISO-ISO 6141 2021-07	2022-07	4180459	14607964
f	Digitaler 4450 Digital 4450	ISO-ISO 6141 2021-07	2022-07	4180459	12899981
g	Pneumator Pneumator	ISO-ISO 6141 2021-07	2022-07	053219	12899984

Referenzzertifikate sind auf www.primasonline.com abrufbar. Reference certificates are available at www.primasonline.com.

Umgebungsbedingungen Ambient conditions

Temperatur Temperature (20...26) °C Feuchte Humidity (20...60) % rF % RH

Messverfahren Measuring procedure

Die Kalibrierung erfolgte durch Vergleichsmessung mit kalibrierten Prüfgasen, einem Temperatur- und Druckkalibrator.

The calibration was carried out by comparison measurement with calibrated test gases, a calibrator of temperature and pressure.

Messergebnisse Measuring results

Kanal Channel ---

Einheit Unit	Bezugswert Reference value	Angezeigter Messwert Indicated measured value	Abweichung Deviation	Zulässige Abweichung ² Allowed deviation ²	Messunsicherheit (k=2) Measurement uncertainty (k=2)	Bewertung Confirmation
CO						
ppm	100,1 ^a	101	0,9	± 11	3,3	pass
ppm	401,0 ^b	397	-4,0	± 21	8,5	pass
ppm	700,0 ^c	717	17,0	± 36	14,4	pass
NO						
ppm	150,3 ^a	150	-0,3	± 9	4,0	pass
ppm	301 ^a	301	0	± 16	6,9	pass
SO2						
ppm	100,1 ^a	99	-1,1	± 11	3,5	pass
O2						
Vol.-%	0,0 ^a	0,09	0,1	± 0,21	0,027	pass
Vol.-%	2,510 ^a	2,58	0,070	± 0,21	0,055	pass
Vol.-%	5,000 ^a	5,08	0,080	± 0,21	0,102	pass
Temperatur						
°C	100,0 ^a	99,1	-0,9	± 1,1	0,24	pass
°C	200,0 ^a	200,1	0,1	± 1,1	0,24	pass
Druck						
hPa	50,0 ^a	50,1	0,1	± 0,9	0,52	pass
hPa	100,0 ^a	100,5	0,5	± 1,6	0,52	pass

^a gemäß Hersteller In accordance with the manufacturer

Besondere Bemerkungen Special remarks

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Calibration certificate Kalibrier-Zertifikat

4319391

Object Controlunit t350 Measuring Box testo 350
 Gegenstand
 Hersteller Manufacturer: TESTO SE & Co. KGaA
 Typ Type description: 0632 3511 0632 3510
 Serien Nr. Serial no.: 03580098 62985047
 Inventar Nr. Inventory no.: ---
 Equipment no.: 14672501 14674794
 Standort Location: ---

Customer Auftraggeber: ALS Laboratory Group (Thailand) Co., Ltd
 Eastern Seaboard Industrial Estate
 TH-21140 A. Plaukdaeng Rayong, Thailand

Kunden Nr. Customer ID no.: 1031994

Order no.: 10842828 / 0520 0055

Date of calibration Datum der Kalibrierung: 09.12.2021

Date of the recommended re-calibration Datum der empfohlenen Rekalibrierung: 09.12.2022

Conformity statement Konformitätsaussage

- ☒ Measured value(s) within the allowable deviation¹. Messwert(e) innerhalb der zulässigen Abweichung¹.
☐ Measured value(s) outside of the allowable deviation¹. Messwert(e) außerhalb der zulässigen Abweichung¹.

¹ The expanded measurement uncertainty was calculated according to EA-4-02 M:2013 with a coverage probability of approx. 95% and contains the uncertainty of the reference, the method and the uncertainty of the unit under test. The statement of conformity is based on the decision rule "Vertrauensniveau 50" (confidence level 50%).

² Die erweiterte Messunsicherheit wurde nach EA-4-02 M:2013 mit einer Überdeckungswahrscheinlichkeit von etwa 95% berechnet und enthält die Unsicherheit der Referenz, des Verfahrens sowie die Unsicherheit des Prüflings. Die Konformitätsaussage erfolgt nach der Entscheidungsregel "Vertrauensniveau 50".
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Seal Stempel



Supervisor Fachverantwortlicher

[Signature]
 Martin Förderer

Technician Techniker

[Signature]
 Johannes Wängler

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Calibration certificate Kalibrier-Zertifikat

4319391

Measuring equipment Messeinrichtungen

Index	Reference Referenz	Traceability Rückführung	Next cal. Rekal.	Certificate-no. Zertifikat-Nr.	Eq.-no. Eq.-Nr.
a	Test gas medium 1 Prüfgas Medium 1	SCS-SCS0026 2021-03	2024-03	4017585	12898976
b	Test gas medium 3 Prüfgas Medium 3	SCS-SCS0026 2021-03	2022-03	4017588	12898982
c	Test gas medium 5 Prüfgas Medium 5	SCS-SCS0026 2021-03	2022-03	4017591	12898984
d	Test gas medium 8 Prüfgas Medium 8	SCS-SCS 2021-07	2022-10	4220471	12898987
e	Test gas medium 7 Prüfgas Medium 7	SCS-SCS0026 2021-03	2022-03	4017586	12898986
f	Test gas medium 11 Prüfgas Medium 11	ISO-ISO 8141 2021-04	2022-04	4017602	14027964
g	Digital 4420 Digital 4420	15070-01-01 2021-07	2022-07	E186673	12965501
h	Pneumator Pneumator	15070-01-01 2021-07	2022-07	D53219	12965547

Reference certificates are available at www.primasonline.com Referenzzertifikate sind auf www.primasonline.com abrufbar

Ambient conditions Umgebungsbedingungen

Temperature Temperatur (20...26) °C Humidity Feuchte (20...60) % RH % rF

Measuring procedure Messverfahren

The calibration was carried out by comparison measurement with calibrated test gases, a calibrator of temperature and pressure.
Die Kalibrierung erfolgte durch Vergleichsmessung mit kalibrierten Prüfgasen, einem Temperatur- und Druckkalibrator.

Measuring results Messergebnisse

Channel Kanal ---

Unit Einheit	Reference value Bezugswert	Indicated measured value probe Angezeigter Mess- wert Kalibriergegen- stand	Deviation Abweichung	Allowed deviation ²⁾ Zulässige Abweichung ²⁾	Measurement uncertainty (k=2) Messunsicherheit (k=2)	Confirmation Bestätigung
CO						
ppm	100,1 ^a	102	1,9	± 11	3,3	pass
ppm	401,0 ^a	401	0,0	± 21	8,5	pass
ppm	700,0 ^a	725	25,0	± 36	14,4	pass
NO						
ppm	150,3 ^a	151	0,7	± 9	4,0	pass
ppm	300 ^a	302	2	± 16	6,9	pass
NO2						
ppm	99,9 ^a	102,7	2,8	± 5,1	3,20	pass
SO2						
ppm	100,1 ^f	97	-3,1	± 6	3,5	pass
O2						
Vol.-%	0,0 ^a	0,08	0,1	± 0,21	0,027	pass
Vol.-%	2,510 ^a	2,56	0,050	± 0,21	0,055	pass
Vol.-%	5,000 ^a	5,08	0,080	± 0,21	0,102	pass
Temperature						
°C	100,0 ^b	99,0	-1,0	± 1,1	0,24	pass
°C	200,0 ^b	199,9	-0,1	± 1,1	0,24	pass
Druck						
hPa	50,0 ^b	49,8	-0,2	± 0,9	0,52	pass
hPa	100,0 ^b	99,9	-0,1	± 1,6	0,52	pass

²⁾ In accordance with the manufacturer gemäß Hersteller

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Calibration certificate Kalibrier-Zertifikat

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Special remarks Besondere Bemerkungen

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

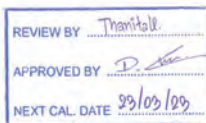
Certificate of Calibration

Represent to Certificate of Calibration ,PTC/07/22099

Certificate No.: PTC/07/22099 Page: 1 of 2
Equipment: Digital Balance Condition: Normal
Manufacturer: Sartorius Serial No: 31709552
Model: MSU224S-100-DU ID No: RYG_EN0003
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/m³

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. Rungroje Metakul



Approved By: (Mr. Keattisak Kerdto)
Laboratory Manager

Reviewed by: (Mr. Kiangsak Kalesri)

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 recognised 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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PENTA CALIBRATION CO., LTD.
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www.pentalcal.com

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 ≤ L₁ ≤ Maximum capacity

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

Nominal test value (g)	Standard Deviation
200	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	0.0000	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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co.Ltd.

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 1215

STANDARD GAS CONCENTRATION (PPM) : 4512

CYLINDER NO : C0745169

CYLINDER PRESSURE (psig) : 1900

CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

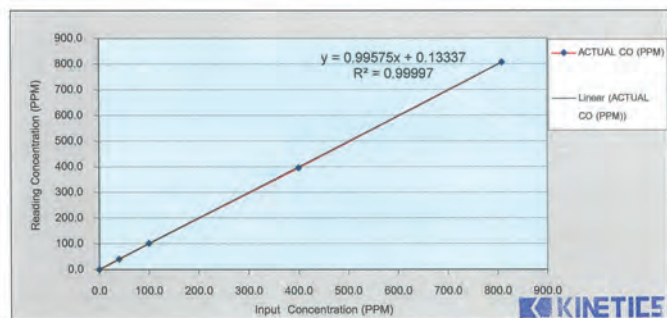
CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.000	0.004	0.004	-
1	40.000	40.531	0.531	1.328
2	100.000	101.135	1.135	1.135
3	400.300	395.446	-4.854	-1.213
4	808.900	807.019	-1.881	-0.233
AVERAGE (%)				0.977

REVIEW BY : Thanitak

APPROVED BY : D

NEXT CAL DATE : 11 May 2023



CALIBRATED BY : คุณพรชัย ภาติกร

DATE : 11 พฤษภาคม 2565

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม : คุณพรชัย ภาติกร โทรศัพท : 02-515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรมาน เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

TEST VALUES			
API MODEL T300		BEFORE	AFTER
1	RANGE	1 - 1000 PPM	100.0
2	STABILITY	≤ 1 PPM	0.004
3	CO MEASURE	2500 - 4900 mV	3947.2
4	CO REFERENCE	2000 - 4800 mV	2521.6
5	PRESEURE	25 - 35 in - Hg-A	29.7
6	SAMPLE FLOW	800 ± 10% cc/min	823
7	SAMPLE TEMP	-48 ± 4 °C	44.7
8	BENCH TEMP	-48 ± 2 °C	48.0
9	WHEEL TEMP	68 ± 2 °C	68.0
10	BOX TEMP	AMBIENT ± 5 °C	34.3
11	PMT DRIVE	250 - 4750 mV	4123.5
12	CO SLOPE	1.0 ± 0.3	0.863
13	CO OFFSET	0.0 ± 0.3	0.009
14	CO READING (AMBIENT)	PPM	0.421
15	ELECTRICAL TEST	-40 ± 2 PPM	39.992
16	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.20 / 12.09 / 16.78 / -15.28
17	ZERO GAS	0.00 PPM	-0.150
18	SPAN GAS	-40.0 PPM	38.903

หมายเหตุ

- ทำการเปลี่ยน O-ring 2 ชิ้น , Spring 1 ชิ้น , Sintered Filter 1 ชิ้น

(คุณพรชัย ภาติกร)
ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางเทคนิค กรุณาติดต่อ : คุณพรชัย ภาติกร โทรศัพท์ : 0-2515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรมาน เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53144 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 21P3177
Page : 1 of 2

Equipment : Digital Vacuum Gauge

Manufacturer : Dwyer

Model : DPGA-00

Serial No. : DVG09

ID No. : BKK_FS0516

Condition As-Received: Used Item

Received Date : 15 September 2021

Calibration Date : 21 September 2021

Reference : 2109-0560WSC

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

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Atmospheric Pressure : 1009 mbar

104 Phatthanakan 40, 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	15PSIXP21	158670	21P2929	03 Sep 2022

2. This instrument was installed in vertical orientation and lower groove of pressure sensor was used as the reference level.

3. This result of calibration was made on request 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)

REVIEW BY : *Attapol P.*
APPROVED BY : *Attapol P.*
NEXT CAL DATE : 22 / 3 / 23

Calibrated by : Attapol Panurach
Issue Date : 22 September 2021

Approved Signatory : *Attapol P.*
[] Phalinee Prapapal
[] Sura Suwanasri
✓ Attapol Panurach

Cert.No.: 21P3177
Page: 2 of 2Result of calibration: Without adjustment
Function: Vacuum Pressure MeasurementRange : 0 inHg to -30 inHg
Resolution : 0.01 inHg

Increasing Pressure

Applied Pressure (inHg)	0.000	-5.000	-10.000	-15.000	-20.000	-26.800
UUC* Indication (inHg)	0.00	-5.07	-10.16	-15.20	-20.30	-27.17
Error (inHg)	0.000	-0.070	-0.160	-0.200	-0.300	-0.370

Decreasing Pressure

Applied Pressure (inHg)	-26.800	-20.000	-15.000	-10.000	-5.000	0.000
UUC* Indication (inHg)	-27.17	-20.30	-15.22	-10.18	-5.07	0.00
Error (inHg)	-0.370	-0.300	-0.220	-0.180	-0.070	0.000

The uncertainty of measurement was ± 0.090 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-

Attapol P.



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: 0-2719-9484



Certificate of Calibration

Certificate No.: 21P1350
Page: 1 of 2

Equipment: Digital Vacuum Gauge

Manufacturer: Dwyer

Model: DPGA-00

Serial No.: DVG03

ID No.: BKK_FS0435

Condition As-Received: Used Item

Received Date: 09 April 2021

Calibration Date: 20 April 2021

Reference: 2104-0323WSC

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

Ambient Temperature: (23 ± 2) °C

104 Phatthanakan 40, Phatthanakan Rd.,

Relative Humidity: (50 ± 15) %

Khwaeng Phatthanakan, Khet Suan Luang,

Atmospheric Pressure: 1010 mbar

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 guidelines.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0113-20	14 Jul 2021

2. This instrument was installed in vertical orientation and lower groove of pressure sensor 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: Suwit Ausarnee
Issue Date: 21 April 2021

Approved Signatory: Attapol P.
[] Phalinee Prabpaipal
[] Sura Suwannasri
[x] Attapol Panurach

B 0256843



Cert.No.: 21P1350
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Vacuum Pressure Measurement

Range: 0 inHg to -30 inHg

Resolution: 0.01 inHg

Increasing Pressure

Applied Pressure (inHg)	0.000	-4.996	-9.996	-14.994	-19.992	-26.487
UUC* Indication (inHg)	0.00	-5.05	-10.10	-15.20	-20.30	-26.90
Error (inHg)	0.000	-0.052	-0.104	-0.206	-0.308	-0.413

Decreasing Pressure

Applied Pressure (inHg)	-26.487	-19.992	-14.994	-9.996	-4.998	0.000
UUC* Indication (inHg)	-26.90	-20.30	-15.20	-10.10	-5.05	0.00
Error (inHg)	-0.413	-0.308	-0.206	-0.104	-0.052	0.000

The uncertainty of measurement was ± 0.090 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-

Attapol P.

a 1046981



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: 0-2719-9484



Certificate of Calibration

Certificate No.: 21P3176
Page: 1 of 2

Equipment: Digital Pressure Gauge

Manufacturer: Dwyer

Model: DPGA-00

Serial No.: DVG04

ID No.: BKK_FS0437

Condition As-Received: Used Item

Received Date: 15 September 2021

Calibration Date: 21 September 2021

Reference: 2109-0560WSC

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

Ambient Temperature: (23 ± 2) °C

104 Phatthanakan 40, Phatthanakan Rd.,

Relative Humidity: (50 ± 15) %

Khwaeng Phatthanakan, Khet Suan Luang,

Atmospheric Pressure: 1009 mbar

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 guidelines.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Pressure Gauge	15PSIXP2I	158670	21P2929	03 Sep 2022

2. This instrument was installed in vertical orientation and lower groove of pressure sensor 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: Suksan Khankaew
Issue Date: 22 September 2021

Approved Signatory: Attapol P.
[] Phalinee Prabpaipal
[] Sura Suwannasri
[x] Attapol Panurach

B 0268463



Cert.No.: 21P3176
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Vacuum Pressure Measurement

Range: 0 inHg to -30 inHg

Resolution: 0.01 inHg

Increasing Pressure

Applied Pressure (inHg)	0.000	-5.000	-10.000	-15.000	-20.000	-26.800
UUC* Indication (inHg)	0.00	-5.06	-10.07	-15.10	-20.13	-26.94
Error (inHg)	0.000	-0.060	-0.070	-0.100	-0.130	-0.140

Decreasing Pressure

Applied Pressure (inHg)	-26.800	-20.000	-15.000	-10.000	-5.000	0.000
UUC* Indication (inHg)	-26.94	-20.14	-15.10	-10.08	-5.04	0.00
Error (inHg)	-0.140	-0.140	-0.100	-0.080	-0.040	0.000

The uncertainty of measurement was ± 0.090 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-

Attapol P.

a 1068736



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2717-3000-24 FAX: 0-2719-9484



Certificate of Calibration

Certificate No.: 21P3175

Page: 1 of 2

Equipment: Vacuum Gauge
Manufacturer: QualityWell
Model: F221AVD
Serial No.: VG01
ID No.: RYG_FS0332

Condition As-Received: Used Item
Received Date: 15 September 2021
Calibration Date: 21 September 2021

Reference: 2109-0560WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1009 mbar

104 Phatthanakan 40, Phatthanakan Rd.,
Khaeng 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 guidelines.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Pressure Gauge	15PSXP21	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.

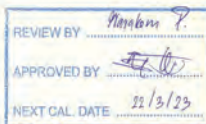
4. Scale and conversion factor is 1 kPa = 0.2953 inHg

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: Suksan Khankaw
Issue Date: 22 September 2021

Approved Signatory: Attapol P.

[] Phalinee Prabpaipal
[] Sura Suwannasri
[x] Attapol Panurach

B 0268462



Cert.No.: 21P3175
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	-4.74	-9.77	-14.83	-19.74	-25.62
UUC* Indication (inHg)	0.0	-5.0	-10.0	-15.0	-20.0	-26.0
Error (inHg)	0.00	-0.26	-0.23	-0.17	-0.26	-0.38

Decreasing Pressure

Applied Pressure (inHg)	-25.64	-19.70	-14.76	-9.77	-4.73	0.00
UUC* Indication (inHg)	-26.0	-20.0	-15.0	-10.0	-5.0	0.0
Error (inHg)	-0.36	-0.30	-0.24	-0.23	-0.27	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 %.

-00-

Attapol P.

a 1068738

SPC Calibration Center

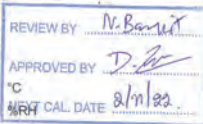


Certificate of Calibration

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

Certificate No.: C06210513
Issued Date: 02 November 2021
Job No.: KSPR2114660
Page: 1 of 2

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



Environment Condition: Temperature 22.2 °C ± 0.6 °C
Humidity 61.8 %RH ± 2.5 %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 Folthong

Calibration Date: 02 November 2021

The Method used: In house method, SPCC-WI-24, base on ASTM E 275-08 and ASTM E 387-04

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

The standard for Wavelength Certificate No. 87146 and 87152

The standard for Photometric Certificate No. 87220

(Mr. Chattuphon Folthong)
Person in charge

SPC
SPC RT Co., Ltd.

(Mr. Dumrong Boonsopon)
Authorized signatory

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

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

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

SPC Calibration Center



Certificate No.: C06210513 Page 2 of 2

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Sld at 5 nm and UUC at 5 nm

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

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5890	0.587	0.0020	0.0045
	0.7616	0.759	0.0026	0.0045
440 nm	1.0263	1.023	0.0033	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5787	0.575	0.0037	0.0045
465 nm	0.7442	0.741	0.0032	0.0045
	1.0039	1.000	0.0039	0.0045
	0.0000	0.000	0.0000	0.0045
546.1 nm	0.5292	0.528	0.0012	0.0045
	0.6805	0.686	0.0005	0.0045
	0.9534	0.952	0.0014	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5468	0.545	0.0018	0.0045
	0.6857	0.694	0.0017	0.0045
635 nm	0.9991	0.998	0.0011	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5851	0.582	0.0031	0.0045
	0.7238	0.721	0.0028	0.0045
	1.0957	1.091	0.0047	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5892	0.567	0.0022	0.0045
	0.6914	0.690	0.0014	0.0045
	1.0881	1.086	0.0021	0.0045

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2114660

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR3900

หมายเลขเครื่อง: 2021761

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
02 Nov 2021			02 Nov 2021		
ปกติ	ไม่ปกติ		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 เปิด - ปิด 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. แรงดันไฟฟ้า (Battery Backup) ≥ 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	807 ได้ 807.3 nm
<input type="checkbox"/>	<input type="checkbox"/>	9. แสงที่แผ่แสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แสงที่แผ่แสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input 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. ฝาปิดกันเปื้อน Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
Turbidimeter					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (≥ 2.5 ไม่นาน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
Automatic titrator					
<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. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เขียนโดย/ชื่อหน้า:

Mr. Chattuphon Polthong
Service Engineer

ENTECH INDUSTRIAL SOLUTION CO., LTD.
 17/121 Soi Ngamwongwan 47, Yaek 46, Toongsongkhong, Laksi, Bangkok 10210 THAILAND
 Tel: 0-2779-8888 Fax: 0-2779-8899 Email: info@entech.co.th

SPCC-FM-R31-02: 23 Nov 2020

Certificate No.: G 650023
Date of issue: 21-Jan-22

Instrument description : Fuel Gas Analyzer
 Instrument model : Testo 340
 Instrument serial no. : 62150585
 ID no. or control no. : RYG_F50465
 Manufacturer : testo SE
 Probe description : -
 Probe model : -
 Probe serial : -
 Customer name : ALS LABORATORY GROUP (THAILAND) CO., LTD.
 Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand

REVIEW BY Namkam P.
 APPROVED BY [Signature]
 NEXT CAL DATE 14/1/23

Total pages of certificate : 3 Pages
 Receiving no. : L-220082
 Receiving date : 14-Jan-22
 Parameter of calibration : Gas Calibration (Oxygen 2.501, 10.00, 21.00 %vol, Carbon Monoxide 80.97, 309.9, 1003 ppm, Nitric Oxide 10.08, 150.9, 320.6 ppm, Sulphur Dioxide 50.04, 100.9, 601.1 ppm)

Condition of UUC : Used
 Ambient condition : All of the Measurement were carried out the stabilized laboratory
 Temperature : 23 ± 5 °C
 Humidity : 55 ± 15 %RH
 Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 46, Toongsongkhong, Laksi, Bangkok 10210

Calibration procedure no. : WI-CL-28-C

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

Date of calibration : 19-Jan-22

[Signature]
 Mr. Sedwaj Nuathong
 Calibration Technician

[Signature]
 Mrs. Nongluck Wongsettee
 Technical Manager

FM-CL-09-C Rev.8

Page 1 of 3

Issued Date 26/02/16

ENTECH INDUSTRIAL SOLUTION CO., LTD.

17/121 Soi Ngamwongwan 47 Yaek 46, Toongsongkhong, Laksi, Bangkok 10210 THAILAND Tel: 0-2779-8888 Fax: 0-2779-8899 Email: info@entech.co.th
 Tax ID : D105536035591 www.entech.co.th

Certificate No.: G 650023

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.501 % Vol	2431/19	Linde	16-Jul-23
Oxygen (O ₂) 10.00 % Vol	2453/19	Linde	18-Jul-23
Oxygen (O ₂) 21.00 % Vol	2426/19	Linde	16-Jul-23
Carbon monoxide (CO) 80.97 ppm	2842/21	Linde	24-Jun-23
Carbon monoxide (CO) 309.9 ppm	2803/21	Linde	22-Jun-23
Carbon monoxide (CO) 1003 ppm	2829/21	Linde	23-Apr-23
Nitric Oxide (NO) 10.08 ppm	3241/21	Linde	25-Jul-23
Nitric Oxide (NO) 150.9 ppm	2857/21	Linde	27-Jun-23
Nitric Oxide (NO) 320.6 ppm	2944/21	Linde	2 Jul 23
Sulphur Dioxide (SO ₂) 50.04 ppm	3205/21	Linde	25-Jul-23
Sulphur Dioxide (SO ₂) 100.9 ppm	4942/20	Linde	20-Nov-22
Sulphur Dioxide (SO ₂) 601.1 ppm	3204/21	Linde	20-Jul-23

Measured room conditions

Temperature : 22.5 °C Humidity : 56.2 %RH Pressure : 1018.3 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 600 ml/min Gas pressure : 1021.9 mbar

Calibration Results Before Adjustment (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.501	2.47	-0.031	0.20
O ₂ (%Vol)	10.00	9.89	-0.11	0.40
O ₂ (%Vol)	21.00	21.12	0.12	0.80
CO (ppm)	80.97	83	2.03	2.8
CO (ppm)	309.9	314	4.1	11
CO (ppm)	1003	1016	13	34
NO (ppm)	10.08	8	-2.08	3.0
NO (ppm)	150.9	162	11.1	5.0
NO (ppm)	320.6	345	24.4	10
SO ₂ (ppm)	50.04	38	-12.04	5.0
SO ₂ (ppm)	100.9	92	-8.9	5.0
SO ₂ (ppm)	601.1	593	-8.1	14

FM-CL-09-C Rev.8

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Issued Date 26/02/16

ENTECH INDUSTRIAL SOLUTION CO., LTD.

17/121 Soi Ngamwongwan 47 Yaek 46, Toongsongkhong, Laksi, Bangkok 10210 THAILAND Tel: 0-2779-8888 Fax: 0-2779-8899 Email: info@entech.co.th
 Tax ID : D105536035591 www.entech.co.th

Certificate No.: G 650023

Calibration Results After Adjustment (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.501	2.47	-0.031	0.20
O ₂ (%Vol)	10.00	9.89	-0.11	0.40
O ₂ (%Vol)	21.00	21.11	0.12	0.80
CO (ppm)	80.97	83	2.03	2.8
CO (ppm)	309.9	314	4.1	11
CO (ppm)	1003	1016	13	34
NO (ppm)	10.08	9	-1.08	3.0
NO (ppm)	150.9	150	-0.9	5.0
NO (ppm)	320.6	318	-2.6	10
SO ₂ (ppm)	50.04	48	-2.04	5.0
SO ₂ (ppm)	100.9	101	0.1	5.0
SO ₂ (ppm)	601.1	604	2.9	14

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

End of Report

FM-CL-09-C Rev.8

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Issued Date 26/02/16

ENTECH INDUSTRIAL SOLUTION CO., LTD.

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 Tax ID : D105536035591 www.entech.co.th



ROTA METER CALIBRATION RESULT JULY 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS0577	01 Jul 22	Y = 1.0202x + 0.1976	1.0000
BKK_FS0579	01 Jul 22	Y = 1.0078x + 0.4789	0.9998
BKK_FS0583	01 Jul 22	Y = 1.016x + 0.3922	1.0000
BKK_FS0584	01 Jul 22	Y = 1.0036x + 2.2262	0.9997
BKK_FS0585	01 Jul 22	Y = 1.0189x - 5.6476	0.9997
BKK_FS0586	01 Jul 22	Y = 1.0095x - 1.1524	0.9995
BKK_FS0587	01 Jul 22	Y = 1.013x - 3.6619	0.9996
BKK_FS0588	01 Jul 22	Y = 1.0154x + 4.8357	0.9999
BKK_FS0589	01 Jul 22	Y = 0.9918x + 4.8069	0.9999
BKK_FS0590	01 Jul 22	Y = 1.0038x - 0.4857	0.9996
BKK_FS0591	01 Jul 22	Y = 0.9705x - 52.174	0.9986
BKK_FS0592	01 Jul 22	Y = 0.9646x - 37.642	0.9985
BKK_FS0593	01 Jul 22	Y = 0.9767x - 58.445	0.9988
BKK_FS0594	01 Jul 22	Y = 0.9902x - 62.87	0.9999
BKK_FS0595	01 Jul 22	Y = 1.0249x - 98.162	0.9999
BKK_FS0596	01 Jul 22	Y = 0.9843x - 26.806	0.9991
BKK_FS0597	01 Jul 22	Y = 0.9802x - 61.653	0.9978
BKK_FS1004	01 Jul 22	Y = 0.9696x + 17.69	0.9990
BKK_FS1005	01 Jul 22	Y = 1.0092x + 2.4571	0.9999
BKK_FS1006	01 Jul 22	Y = 1.168x - 5.566	0.9997
BKK_FS1007	01 Jul 22	Y = 0.9917x + 1.6592	1.0000
BKK_FS1008	01 Jul 22	Y = 1.0132x + 0.7207	1.0000
BKK_FS1009	01 Jul 22	Y = 1.0132x + 1.1633	0.9960
BKK_FS1010	01 Jul 22	Y = 1.0033x + 0.5758	0.9999
BKK_FS1011	01 Jul 22	Y = 1.0234x + 0.1759	0.9996
BKK_FS1012	01 Jul 22	Y = 1.0106x - 2.0048	0.9997
BKK_FS1013	01 Jul 22	Y = 0.9677x - 35.851	0.9997
BKK_FS1014	01 Jul 22	Y = 1.0021x + 0.3148	0.9998
BKK_FS1015	01 Jul 22	Y = 0.9994x + 1.786	1.0000
BKK_FS1016	01 Jul 22	Y = 1.0105x - 80.256	0.9998
BKK_FS1017	01 Jul 22	Y = 0.9995x + 0.649	1.0000
BKK_FS1018	01 Jul 22	Y = 1.0011x + 1.1786	1.0000
BKK_FS1019	01 Jul 22	Y = 1.0023x - 68.424	0.9996
BKK_FS1020	01 Jul 22	Y = 1.0547x - 0.666	0.9998
BKK_FS1021	01 Jul 22	Y = 1.018x - 3.3286	0.9998
BKK_FS1022	01 Jul 22	Y = 0.9932x - 57.035	0.9986
BKK_FS1023	01 Jul 22	Y = 1.0094x + 0.0717	0.9999
BKK_FS1024	01 Jul 22	Y = 1.0042x + 0.4086	0.9997
BKK_FS1025	01 Jul 22	Y = 1.0132x - 88.507	0.9996



ROTA METER CALIBRATION RESULT JULY 2022

Rotameter ID.	Calibration Date	Regression Result	Coefficient (R ²)
BKK_FS1026	01 Jul 22	Y = 1.0018x + 1.0776	0.9997
BKK_FS1027	01 Jul 22	Y = 1.0053x + 0.231	0.9995
BKK_FS1028	01 Jul 22	Y = 0.9792x - 60.312	0.9982
BKK_FS1029	01 Jul 22	Y = 0.9935x + 0.8234	1.0000
BKK_FS1030	01 Jul 22	Y = 1.0039x + 0.515	0.9999
BKK_FS1031	01 Jul 22	Y = 1.009x - 79.295	0.9998
BKK_FS1039	01 Jul 22	Y = 0.9879x + 7.3524	0.9996
BKK_FS1040	01 Jul 22	Y = 0.9704x + 88.336	0.9987
BKK_FS1041	01 Jul 22	Y = 1.0645x - 1.7878	0.9999
BKK_FS1042	01 Jul 22	Y = 0.9983x + 3.6262	0.9998
BKK_FS1043	01 Jul 22	Y = 1.0069x - 6.9619	1.0000
BKK_FS1044	01 Jul 22	Y = 1.0355x - 0.6214	0.9997
BKK_FS1161	01 Jul 22	Y = 1.0126x - 0.7738	0.9999
BKK_FS1162	01 Jul 22	Y = 0.9994x + 2.6357	0.9995
BKK_FS1163	01 Jul 22	Y = 0.977x - 55.03	0.9987
BKK_FS1164	01 Jul 22	Y = 0.9914x + 0.8427	0.9997
BKK_FS1165	01 Jul 22	Y = 0.9893x + 6.5919	0.9998
BKK_FS1166	01 Jul 22	Y = 1.0031x - 77.881	0.9996
BKK_FS1200	01 Jul 22	Y = 1.0313x - 0.4602	0.9995
BKK_FS1201	01 Jul 22	Y = 1.0045x + 0.15	0.9996
BKK_FS1202	01 Jul 22	Y = 0.9702x - 44.156	0.9994
RYG_FS0197	01 Jul 22	Y = 1.0039x - 0.179	0.9999
RYG_FS0198	01 Jul 22	Y = 0.9971x + 16.648	0.9999
RYG_FS0199	01 Jul 22	Y = 1.0832x - 2.6367	1.0000

Review By :

(Mr. Wichan Choonharat)

Enviro Field Services Manager

Approved By :

(Mr. Sarayuth Jitranont)

Assistant General Manager

Certificate of System Qualification

GC-OQ

System ID: GC-6
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Phattanasak 40, Phattanasak 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

REVIEW BY: *Suchada T.*
APPROVED BY: *Sarayuth M.*
NEXT CAL DATE: *21 Apr 2023*

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: ≥ -2.0 and ≤ 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

Setpoint Status: Pass
Setpoint: 25.0 psi Actual: 24.9 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890

Back SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: 0.0 psi /5 minutes

Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Back SSL

Setpoint Status: Pass

Setpoint: 25.0 psi Actual: 24.9 psi

Accuracy: 0.1 psi

Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

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

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: ≤ 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: ≤ 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: ≤ 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

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

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

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Setpoint Status: Pass

Zone: Oven
Setpoint/Actual
Temperature: 230.0 231.5 °C
Accuracy: 1.5 °C
Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)
 ≤ 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: ≥ -1.0 % setpoint in K (-3.7 °C)
 ≤ 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average
Temperature: 100.0 100.4667 °C
Stability: 0.1 °C
Agilent Recommended: ≤ 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

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Setpoint Status: Completed

Injection Volume on Column: 1.0 μ 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: 0.06 pA
Drift: 0.10 pA/hr
Agilent Recommended: ≤ 0.10 Status: Pass ≤ 2.50 Status: 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 μ L
Area RSD: 0.42 % Retention Time RSD: 0.16 %
Agilent Recommended: ≤ 3.00 Status: Pass ≤ 1.00 Status: Pass

Overall Injection Precision Test Status

Pass

Signal to Noise

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

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Tested Combination1 Front SSL / Front FID

Name: Injection Tower
7890

Setpoint Status: Pass

Signal to Noise: 1174861

Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Name: Injection Tower
7693A

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: 7890

Setpoint Status: Pass

Base Signal: 10.4 pA

ASTM Noise Drift
pA pA/hr
0.05 0.00

Agilent Recommended: <= 0.10 <= 2.50

Status: Pass Pass

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

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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 µL

Area RSD: 1.16 % Retention Time RSD: 0.12 %

Agilent Recommended: <= 3.00 <= 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2 Back SSL / Back FID

Name: Injection Tower
7890

Setpoint Status: Pass

Signal to Noise: 805466

Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

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

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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
Vial Heater: Not installedDate: October 21, 2021 10:05:40 AM
System ID: GC-6

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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-6
Oven Type: StandardDate: October 21, 2021 10:05:40 AM
System ID: GC-6

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Inlet 1

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

Inlet 2

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

Detector 1

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

Detector 2

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

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

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Electronic Signature

Purpose

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Signature Creation Date:	October 21, 2021
Reason for Signature:	Executed protocol and published this original version of document

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

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User Name: suriya.thongkaew
Hostname: ASBK0W7015

System ID: GC-6
Print Date: October 21, 2021 18:05:48 AM

OQ GC ALS CN11481068 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	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 20, 2021 12:24:57 PM	Audit	EqlLoaded	Session	EQP details for primary technique [GC]: File path: [ProtocolPacks\GC\Configurations\02.01\GC_02.01.eql] EQP File Name: [GC_02.01.eql] EQP Name: [AgilentRecommended]
October 20, 2021 12:25:02 PM	End	Configuration	Session	None
October 20, 2021 12:25:09 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 setpoints associated	None
October 20, 2021 12:30:25 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890 - Qualitative Test - No setpoints 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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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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User Name: suriya.thongkaew
Hostname: ASBK0W7015

System ID: GC-6
Print Date: October 21, 2021 18:05:48 AM

OQ GC ALS CN11481068 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 20, 2021 1:02:16 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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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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User Name: suriya.rhongkasee

Host Name: ASBKKW7015

System ID: GC-6

Print Date: October 21, 2021 10:05:46 AM

QO GC ALS CNT1461066 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 1:23:29 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 1:27:42 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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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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User Name: suriya.rhongkasee

Host Name: ASBKKW7015

System ID: GC-6

Print Date: October 21, 2021 10:05:46 AM

DQ GC ALS CNT1461066 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 1:34:46 PM	Start	Execution	Detector Flow Accuracy - Back FID - Type: Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 20, 2021 1:36:23 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 1:36:26 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 1:36:58 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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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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User Name: suriya.rhongkasee

Host Name: ASBKKW7015

System ID: GC-6

Print Date: October 21, 2021 10:05:46 AM

DQ GC ALS CNT1461066 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 - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count: 1
October 20, 2021 2:10:51 PM	Start	Execution	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 100.0°C - L: <= 0.5°C	None
October 20, 2021 2:31:38 PM	Audit	Data	GC Oven Temperature Stability - 7890 - Temperature: Oven - S: 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 - S: 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 2:43:08 PM	Audit	AccClosed	Session	None
October 21, 2021 9:18:58 AM	Audit	AccRestarted	Session	None
October 21, 2021 9:19:02 AM	Audit	SessionResumed	Session	None
October 21, 2021 9:19:05 AM	Start	Qualification	Session	OQ
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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Date: October 21, 2021 10:05:40 AM
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User Name: suriya.rhongkasee

Host Name: ASBKKW7015

System ID: GC-6

Print Date: October 21, 2021 10:05:46 AM

DQ GC ALS CNT1461066 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	SessionResumed	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 9:20:45 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID - Part of System Preparation - No limits associated	Data File Path: C:\Chem32\10\DATA\OQP\2021\OQP\2021_F 2021-10-20 15-49-01\SCOUT_F001.D\F1.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:\Chem32\10\DATA\OQP\2021\OQP\2021_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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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

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User Name: suriya.thongkane
Hostname: ASBKKW7015
System ID: GC-6
Print Date: October 21, 2021 10:05:40 AM

DQ GC ALS CN11461066 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 (Rel. Time) <= 1.00%	None
October 21, 2021 9:32:50 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_F 2021-10-20 16-51-16\INPREC_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 (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_F 2021-10-20 16-51-16\INPREC_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 (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_F 2021-10-20 16-51-16\INPREC_F004.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 (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_F 2021-10-20 16-51-16\INPREC_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 (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_F 2021-10-20 16-51-16\INPREC_F006.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 (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_F 2021-10-20 16-51-16\INPREC_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: suriya.thongkane
Hostname: ASBKKW7015
System ID: GC-6
Print Date: October 21, 2021 10:05:40 AM

DQ GC ALS CN11461066 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 (Rel. 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 files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 16-51-16\SGTONS_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 9:34:16 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 files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\SCOUT_B001.D\FID2B.ch
October 21, 2021 9:35:27 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
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User Name: suriya.thongkane
Hostname: ASBKKW7015
System ID: GC-6
Print Date: October 21, 2021 10:05:40 AM

DQ GC ALS CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:35:06 AM	Audit	Data	Noise and Drift - Back FID - Detector FID - L (Noise) <= 0.10 pA - L (Drift) <= 2.50 pA/hour	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\INPREC_B001.D\FID2B.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 pA/hour	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 (Rel. 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 (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\INPREC_B002.D\FID2B.ch
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\INPREC_B003.D\FID2B.ch
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\INPREC_B004.D\FID2B.ch
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\INPREC_B005.D\FID2B.ch

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

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User Name: suriya.thongkane
Hostname: ASBKKW7015
System ID: GC-6
Print Date: October 21, 2021 10:05:40 AM

DQ GC ALS CN11461066 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2021 9:38:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\INPREC_B006.D\FID2B.ch
October 21, 2021 9:39:57 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. Time) <= 1.00%	Data files Path : C:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\INPREC_B007.D\FID2B.ch
October 21, 2021 9:39:08 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID - GC - L (Area) <= 3.00% - L (Rel. 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:\Chem32\1\DATA\AQPV20\21\OQPV2021_B 2021-10-20 17-13-45\SGTONS_B001.D\FID2B.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	OQ
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

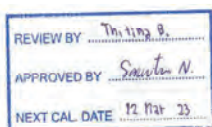
Pass

Instrument Tests

Pass

Autosampler Operation

Pass



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

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Appendix is an integral part of
 Certificate of Accreditation No: 73/2022 of 14/02/2022

Entity accredited according to ČSN EN ISO/IEC 17025:2018:

ALS Czech Republic, s.r.o.
 Na Harčě 336/9, 190 00 Praha 9 - Vysočany

Testing laboratory Workplaces:

- | | | |
|----|----------------------|--|
| 1 | Prague | Na Harčě 336/9, 190 00 Praha 9 |
| 2 | Česká Lípa | Bendlova 1687/7, 470 01 Česká Lípa |
| 3 | Pardubice | V Ráji 906, 530 02 Pardubice |
| 4 | Brno | Videňská 134/102, 619 00 Brno |
| 5 | Ostrava | Vratimovská 11, 718 00 Ostrava |
| 6 | Plzeň | Lobezská 15, 30146 Plzeň |
| 7 | Lovosice | U Zdymaděl 827, 410 02 Lovosice |
| 8 | Rožnov pod Radhoštěm | 1. Máje 823, budova C6,
756 61 Rožnov pod Radhoštěm |
| 9 | Kroměříž | Kotojedská 2588/91, 767 01 Kroměříž |
| 10 | Prague | Na Harčě 916/9a, 190 00 Praha 9 |
| 11 | Prague | Kolbenova 942/38a, 190 00 Praha 9 |
| 12 | Liberec | Jugoslávská 11, 460 07 Liberec |

The Laboratory has a flexible scope of accreditation permitted as detailed in the Annex.

Updated list of activities provided within the required flexible scope of accreditation is available on the laboratory website www.alsglobal.cz or at the Quality Manager.

The Laboratory provides expert opinions and interprets test results.

The Laboratory is qualified to carry out independent sampling.

Tests:

Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
1	General Chemistry		
1.1 ¹	Determination of elements ⁴¹ by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values ⁵³ including the calculation of total mineralization and calculating the sum of Ca+Mg	CZ_SOP_D06_02_001 (US EPA 200.7, ČSN EN ISO 11885, US EPA 6010, SM 3120, ČSN 75 7358)	Water ⁶¹ , extracts ⁶² , liquid samples ⁶³
1.2 ¹	Determination of elements ⁴¹ by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values ⁵³	CZ_SOP_D06_02_001 (US EPA 200.7, ČSN EN ISO 11885, US EPA 6010, SM 3120)	Solid samples ⁶⁵ , building materials ⁶² , materials for building ⁶⁹
1.3 ¹	Determination of elements ⁴¹ by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values ⁵³	CZ_SOP_D06_04_001 (US EPA 200.7, ČSN EN ISO 11885)	Food, feed ⁶³
1.4 ¹	Determination of elements ⁴¹ by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values ⁵³	CZ_SOP_D06_04_001 (US EPA 200.7, ČSN EN ISO 11885)	Biological materials ⁷⁷



Appendix is an integral part of
 Certificate of Accreditation No: 73/2022 of 14/02/2022

Entity accredited according to ČSN EN ISO/IEC 17025:2018:

ALS Czech Republic, s.r.o.
 Na Harčě 336/9, 190 00 Praha 9 - Vysočany

Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
1.5 ¹	Determination of elements ⁴⁷ by atomic emission spectrometry with inductively coupled plasma and calculation of Cr ³⁺ from measured values	CZ_SOP_D06_02_001 (US EPA 200.7, ČSN EN ISO 11885, ČSN EN 13211, ČSN EN 14385, ČSN EN 14902, IO 3.4, US EPA 29)	Emission ⁷⁸ , imission ⁷⁹
1.6 ¹	Determination of elements ⁴⁷ by atomic emission spectrometry with inductively coupled plasma	CZ_SOP_D06_04_001 (US EPA 200.7, ČSN EN ISO 11885, CL/PhEur/USP)	Pharmaceutical material
1.7 ¹	Determination of elements ⁴¹ by mass spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values ⁵³ including the calculation of total mineralization and calculating the sum of Ca+Mg	CZ_SOP_D06_02_002 (US EPA 200.8, ČSN EN ISO 17294-2, US EPA 6020A, ČSN 75 7358)	Water ⁶¹ , extracts ⁶² , liquid samples ⁶³
1.8 ¹	Determination of elements ⁴¹ by mass spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values	CZ_SOP_D06_02_002 (US EPA 200.8, ČSN EN ISO 17294-2, US EPA 6020A)	Solid samples ⁶⁵ , building materials ⁶² , materials for building ⁶⁹
1.9 ¹	Determination of elements ⁴¹ by mass spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values	CZ_SOP_D06_04_002 (US EPA 200.8, ČSN EN ISO 17294-2, ČSN EN 15111)	Food, feed ⁶³
1.10 ¹	Determination of elements ⁴¹ by mass spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values	CZ_SOP_D06_04_002 (US EPA 200.8, ČSN EN ISO 17294-2)	Biological materials ⁷⁷
1.11 ¹	Determination of elements ⁴¹ by mass spectrometry with inductively coupled plasma and calculation of Cr ³⁺ from measured values	CZ_SOP_D06_02_002 (US EPA 200.8, ČSN EN ISO 17294-2, ČSN EN 13211, ČSN EN 14385, ČSN EN 14902, US EPA 29)	Emission ⁷⁸ , imission ⁷⁹
1.12 ¹	Determination of elements ⁴⁰ by mass spectrometry with inductively coupled plasma	CZ_SOP_D06_04_002 (US EPA 200.8, ČSN EN ISO 17294-2, ČSN EN 15111, CL/PhEur/USP)	Pharmaceutical material
1.13 ¹	Determination of Hg by atomic absorption spectrometry	CZ_SOP_D06_02_003 (ČSN 46 5735, ČSN 75 7440)	Emission ⁷⁸ , imission ⁷⁹
1.14 ²	Determination of Hg by single-purpose atomic absorption spectrometer	CZ_SOP_D06_07_004 (ČSN 75 7440, ČSN 46 5735)	Water ⁶¹ , extracts ⁶² , liquid samples ⁶³ , solid samples ⁶⁵
1.15 ²	Determination of elements ⁴⁹ by flame AAS method and stoichiometric calculations of compounds concentration from measured values	CZ_SOP_D06_07_005 (ČSN ISO 8288, ČSN 75 7400, ČSN EN 1233,	Water ⁶¹ , extracts ⁶² , liquid samples ⁶³

Entity accredited according to ČSN EN ISO/IEC 17025:2018:

ALS Czech Republic, s.r.o.
Na Harfě 336/9, 190 00 Praha 9 - Vysočany

Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
		ČSN ISO 7980, ČSN ISO 9964, Perkin-Elmer specifications)	
1.16 ²	Determination of elements ⁴⁹ by flame AAS method and stoichiometric calculations of compounds concentration from measured values	CZ_SOP_D06_07_005 (ČSN ISO 8288, ČSN 75 7400, ČSN EN 1233, ČSN ISO 7980, ČSN ISO 9964, Perkin-Elmer specifications)	Solid samples ⁸⁵
1.17 ²	Determination of elements ⁴⁹ by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values	CZ_SOP_D06_07_006 (ČSN EN ISO 11885, ATIM3-0032)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸¹
1.18 ²	Determination of elements ⁴⁹ by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values	CZ_SOP_D06_07_006 (ČSN EN ISO 11885, ČSN EN 15410, ČSN EN 15411)	Solid samples ⁸⁵ , solid recovered fuels
1.19 ²	Determination of Kjeldahl nitrogen by spectrophotometry	CZ_SOP_D06_07_007.A (ČSN EN 25663, ČSN ISO 7150-1)	Water ⁹¹ , extracts ⁹²
1.20 ²	Determination of Kjeldahl nitrogen by spectrophotometry	CZ_SOP_D06_07_007.B (ČSN EN 25663, ČSN EN 13342, ČSN ISO 7150-1)	Solid samples ⁸⁵
1.21 ²	Determination of Cr ^{VI} by spectrophotometry with diphenylcarbazide	CZ_SOP_D06_07_008 (ČSN ISO 11083)	Water ⁹¹ , extracts ⁹² , absorption solutions from emission samples
1.22 ²	Determination of total phosphorus and orthophosphate by spectrophotometry and calculation of P ₂ O ₅ from measured values	CZ_SOP_D06_07_009.A (ČSN EN ISO 6878)	Water ⁹¹ , extracts ⁹²
1.23 ²	Determination of total phosphorus by spectrophotometry and calculation of P ₂ O ₅ from measured values	CZ_SOP_D06_07_009.B (ČSN EN 14672, ČSN EN ISO 6878)	Sludge, technological sludge products
1.24 – 1.28	Reserved		
1.29 ²	Determination of nonionic surfactants (BiAS) by spectrophotometry using the HACH cuvette test	CZ_SOP_D06_07_014 (Hach Instruction)	Water ⁹¹ , extracts ⁹²
1.30 ²	Determination of sum of sulfane and sulfide by spectrophotometry and calculation of free sulfane from measured values	CZ_SOP_D06_07_015.A (ČSN 83 0520-16:1978, ČSN 83 0530-31:1980 SM 4500-S ² -D)	Water ⁹¹ , extracts ⁹²
1.31 ²	Determination of sum of sulfane and sulfide by spectrophotometry	CZ_SOP_D06_07_015.B (ČSN 83 0520-16:1978, ČSN 83 0530-31:1980)	Solid samples ⁸⁵ , building materials ⁴² , materials for building ⁸⁹
1.32 ²	Determination of sum of sulfane and sulfide by spectrophotometry	CZ_SOP_D06_07_015.C (ČSN 83 0520-16:1978, ČSN 83 0530-31:1980, ČSN 83 4712 No. 3)	Absorption solutions from emission samples

Entity accredited according to ČSN EN ISO/IEC 17025:2018:

ALS Czech Republic, s.r.o.
Na Harfě 336/9, 190 00 Praha 9 - Vysočany

Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
1.33 ¹	Determination of sulfate by turbidimetry using discrete spectrophotometry and calculation of sulfate sulfur from measured values	CZ_SOP_D06_02_016 (US EPA 375.4, SM 4500-SO ₄ ²⁻)	Water ⁹¹ , extracts ⁹²
1.34 ²	Determination of nitrite sum and sum of nitrite and nitrate nitrogen by discrete spectrophotometry and calculation of nitrites and nitrates from measured values	CZ_SOP_D06_02_019 (ČSN EN ISO 11732, ČSN EN ISO 13395, SM 4500-NO ₂ ⁻ , SM 4500-NO ₃ ⁻)	Liquid samples
1.35 ¹	Determination of the number of asbestos and mineral fibers by SEM / EDS	CZ_SOP_D06_02_018 (ISO 14966, except chap. 5, 6.1 and 6.2, VDI 3492, except chap. 5 and 6, Decree No. 6/2003 Coll., Government Decree No. 361/2007 Coll., Annex No. 3)	Outdoor and indoor air, working environment - exposed filters
1.36 ¹	Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and calculation of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia, and dissociated ammonium ions from measured values including the calculation of total mineralization	CZ_SOP_D06_02_019 (ČSN EN ISO 11732, ČSN EN ISO 13395, SM 4500-NO ₂ ⁻ , SM 4500-NO ₃ ⁻)	Water ⁹¹ , extracts ⁹²
1.37 ²	Determination of sum of ammonia and ammonium ions by spectrophotometry and calculation of ammonia nitrogen, free ammonia, and dissociated ammonium ions from measured values	CZ_SOP_D06_07_020 (ČSN ISO 7150-1, ČSN EN ISO 21877)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸¹ , absorption solutions from emission samples
1.38 ²	Determination of nitrite nitrogen by spectrophotometry and calculation of nitrite from measured values	CZ_SOP_D06_07_021 (ČSN EN 26777)	Water ⁹¹ , extracts ⁹²
1.39 ¹	Determination of orthophosphate by discrete spectrophotometry and calculation of orthophosphate phosphorus from measured values including the calculation of total mineralization	CZ_SOP_D06_02_022 (ČSN EN ISO 6878, SM 4500-P)	Water ⁹¹ , extracts ⁹²
1.40 ²	Determination of chloride by potentiometric titration	CZ_SOP_D06_07_023.A (ČSN 03 8526:1989, ČSN 83 0530-20:1980, SM 4500-Cl ⁻ D)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸¹
1.41 ²	Determination of chloride by potentiometric titration and calculation of NaCl from measured values	CZ_SOP_D06_07_023.B (ČSN EN 480-10)	Solid samples ⁸⁵ , building materials ⁴² , materials for building ⁸⁹
1.42 ¹	Determination of Hg by atomic absorption spectrometry	CZ_SOP_D06_04_024 (ČSN 46 5735, ČSN 75 7440, CL/PhEur/USP)	Food, feed ⁴¹ , biological materials ⁷⁷ , Pharmaceutical materials
1.43 ²	Determination of extractable organically bound halogens (EOX) by coulometry	CZ_SOP_D06_07_025.A (DIN 38409-H8, DIN 38414-S17)	Water ⁹¹ , extracts ⁹²

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1.44 ²	Determination of extractable organically bound halogens (EOX) by coulometry	CZ_SOP_D06_07_025.B (DIN 38409-H8, DIN 38414-S17)	Solid samples ⁸⁵
1.45 ²	Determination of adsorbable organically bound halogens (AOX) by coulometry	CZ_SOP_D06_07_026 (ČSN EN 16166, DIN 38414-S18)	Solid samples ⁸⁵
1.46 ²	Determination of total halogens (TX) by coulometry	CZ_SOP_D06_07_027 (US EPA 9076)	Solid samples ⁸⁵ , oils, organic solvents
1.47 ²	Determination of adsorbable organically bound halogens (AOX) by coulometry	CZ_SOP_D06_07_028 (ČSN EN ISO 9562, TNI 757531)	Water ⁹¹ , extracts ⁹²
1.48 ²	Determination of phenol index by spectrophotometric method after distillation	CZ_SOP_D06_07_029 (ČSN ISO 6439)	Solid samples ⁸⁵
1.49	Reserved		
1.50 ²	Determination of anionic surfactants by measurement of the methylene blue index (MBAS) by spectrophotometry	CZ_SOP_D06_07_031 (ČSN EN 903, SM 5540 C)	Water ⁹¹ , extracts ⁹²
1.51 ²	Determination of absorbance and transmittance by spectrophotometry	CZ_SOP_D06_07_032 (ČSN 75 7360)	Water ⁹¹ , extracts ⁹²
1.52* 1.23,4,5,6,7, 8,9	Field measurement of turbidity ZFn by turbidimeter	CZ_SOP_D06_01_033 (ČSN EN ISO 7027-1)	Water ⁹¹
1.53 ²	Determination of humic substances by spectrophotometry	CZ_SOP_D06_07_034 (ČSN 75 7536)	Drinking, raw, surface, ground water
1.54 ²	Determination of water colour by spectrophotometric method	CZ_SOP_D06_07_035 (ČSN EN ISO 7887)	Water ⁹¹ , extracts ⁹²
1.55 ²	Determination of electrical conductivity	CZ_SOP_D06_07_036 (ČSN EN 27888)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸¹
1.56 ²	Determination of pH electrochemically	CZ_SOP_D06_07_037 (ČSN ISO 10523)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸¹
1.57 ²	Biodegradation of organic compounds in aqueous medium – Static test (Zahn-Wellens method) calculated from the measured values of COD _{Cr}	CZ_SOP_D06_07_038 (ČSN EN ISO 9888, OECD 302B, with COD _{Cr} determination according to CZ_SOP_D06_07_040)	Chemicals and chemical products, water ⁹¹ and waste leachate ⁹²
1.58	Reserved		
1.59 ²	Determination of chemical oxygen demand using dichromate (COD _{Cr}) by titration	CZ_SOP_D06_07_040 (ČSN ISO 6060)	Water ⁹¹ , extracts ⁹²
1.60	Reserved		
1.61 ²	Determination of analytical water and gross water by gravimetry and calculation of total water from measured values	CZ_SOP_D06_07_041 (ČSN 44 1377, ČSN EN ISO 18134-1, ČSN EN ISO 18134-2, ČSN EN ISO 18134-3, ČSN P CEN/TS 15414-1, ČSN P CEN/TS 15414-2, ČSN EN ISO 21660-3, ČSN EN 12880, ČSN EN 14346, ČSN EN 15002)	Solid fossil fuels, solid biofuels, solid recovered fuels, sludge, waste
1.62 – 1.63	Reserved		

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1.64 ¹	Determination of dissolved oxygen (in the laboratory) by electrochemical method with optical sensor	CZ_SOP_D06_02_043 (ČSN ISO 17289)	Water ⁹¹
1.65* 1.23,4,5,6,7, 8,9	Determination of dissolved oxygen by electrochemical method with membrane probe	CZ_SOP_D06_01_044 (ČSN EN ISO 5814)	Water ⁹¹
1.66 ^{1,3}	Determination of dry matter by gravimetry and calculation of moisture from measured values	CZ_SOP_D06_01_045 (ČSN ISO 11465, ČSN EN 12880, ČSN EN 14346:2007)	Solid samples ⁸⁵
1.67 ²	Determination of dry matter by gravimetry and calculation of moisture from measured values	CZ_SOP_D06_07_046 (ČSN ISO 11465, ČSN EN 12880, ČSN EN 14346:2007, ČSN 46 5735)	Solid samples ⁸⁵
1.68 ²	Determination of ash by gravimetry and calculation of loss on ignition from measured values	CZ_SOP_D06_07_047.A (ČSN EN 15169, ČSN EN 15935, ČSN EN 13039, ČSN 72 0103, ČSN 46 5735)	Solid samples ⁸⁵ , silicate materials
1.69	Reserved		
1.70 ²	Determination of ash by gravimetry and calculation of loss on ignition from measured values	CZ_SOP_D06_07_047.C (ČSN ISO 1171, ČSN EN ISO 18122, ČSN EN ISO 21656, ČSN EN ISO 6245)	Solid and liquid fuels
1.71 ¹	Qualitative determination of asbestos by SEM/EDS	CZ_SOP_D06_02_048 (ISO 22262-1, VDI 3866, Part 5, DM06/09/94 GU n° 288 10/12/1994 All. 1 Met. B – quantitative determination)	Solid samples ⁸⁵ (except liquid waste, biowaste) building materials ⁸⁹ , materials for building ⁴²
1.72 ¹	Qualitative determination of asbestos by SEM/EDS	CZ_SOP_D06_02_049 (VDI 3866, Part 5, DM 06/09/94 GU n° 288 10/12/1994 All. 1 Met. B.)	Solid samples ⁸⁵ (except liquid waste, biowaste) building materials ⁸⁹ , materials for building ⁴²
1.73 ²	Determination of water content by Karl Fischer method	CZ_SOP_D06_07_050 (ČSN ISO 760)	Liquid samples ⁸¹ , solid samples ⁸⁵
1.74	Reserved		
1.75 ²	Determination of suspended solids, fixed suspended solids, total solids and fixed total solids by gravimetry and calculation of volatile suspended solids and volatile total solids from measured values	CZ_SOP_D06_07_052 (ČSN 75 7350, SM 2540 B, SM 2540 D, SM 2540 E)	Water ⁹¹ , extracts ⁹²
1.76 ²	Determination of suspended solids using glass fibre filters by gravimetry	CZ_SOP_D06_07_053 (ČSN EN 872)	Water ⁹¹ , extracts ⁹²
1.77 ²	Determination of dissolved solids (RL105) and fixed dissolved solids (RAS) using glass fibre filters by gravimetry and calculation of volatile dissolved solids from measured values	CZ_SOP_D06_07_054 (ČSN 75 7346, ČSN 75 7347)	Water ⁹¹ , extracts ⁹²

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
1.78 ²	Determination of total carbon (TC) and inorganic carbon (TIC) by IR detection and calculation of total organic carbon (TOC), carbonates and organic matter from measured values	CZ_SOP_D06_07_055 (ČSN EN 13137:2002, ČSN EN 15936, ČSN ISO 10694)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
1.79 ¹	Determination of total organic carbon (TOC), dissolved organic carbon (DOC), total inorganic carbon (TIC) and total carbon (TC) by IR detection	CZ_SOP_D06_02_056 (ČSN EN 1484, SM 5310)	Water ⁹¹ , extracts ⁹²
1.80 ¹	Determination of nonpolar extractive substances by infrared spectrometry and calculation of polar extractive substances from measured values	CZ_SOP_D06_02_057 (ČSN 75 7505:2006, SS 028145, STN 83 0520-27:2015, STN 83 0530-36, STN 830540-4, US EPA 418.1, SM 5520 F, DS/R 209, SFS 3010)	Water ⁹¹ , extracts ⁹²
1.81 ¹	Determination of extractive and non-polar extractive compounds by infrared spectrometry and calculation of polar extractive substances from measured values	CZ_SOP_D06_02_058 (ČSN 028145, TNV 75 8052, ISO/TR 11046, US EPA 418.1, SM 5520 F, DS/R 209, SFS 3010)	Solid samples ⁸⁵
1.82 ¹	Determination of extractive substances by infrared spectrometry and calculation of polar extractive substances from measured values	CZ_SOP_D06_02_059 (ČSN 75 7506, SS 028145, STN 83 0520-27:2015, STN 83 0540-4, DS/R 209, SFS 3010)	Water ⁹¹ , extracts ⁹²
1.83 ¹	Determination of alpha modification of silicon dioxide in respirable dust by infrared spectrometry	CZ_SOP_D06_02_060 (NIOSH 7602)	Dust
1.84* 1.2.3.4.5.6.7, 8.9.12	Field determination of free and total chlorine and chlorine dioxide by DPD method using HACH sets and bound chlorine by calculation from measured values	CZ_SOP_D06_01_061 (HACH COMPANY methods, ČSN EN ISO 7393-2)	Drinking water, warm water, raw water
1.85* 1.2.3.4.5.6.7, 8.9.12,	Field measurement of temperature	ČSN 75 7342	Water ⁹¹
1.86* 1.2.3.4.5.6.7, 9	Field measurement of electrical conductivity	CZ_SOP_D06_01_063 (ČSN EN 27888)	Water ⁹¹
1.87* 1.2.3.4.5.6.7, 8.9.12,	Field measurement of pH electrochemically	CZ_SOP_D06_01_064 (ČSN ISO 10523)	Water ⁹¹

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1.88 ¹	Sensory analysis of water – determination of odour and taste	CZ_SOP_D06_04_065 (TNV 75 7340:2005, ČSN EN 1622, STN EN 1622)	Drinking water
1.89 ²	Determination of phenols by continuous flow analysis (CFA) method spectrophotometrically	CZ_SOP_D06_07_066 (ČSN EN ISO 14402, SKALAR Company methodology)	Water ⁹¹ , extracts ⁹² , absorption solution from emission sampling
1.90 ²	Determination of anionic surfactants by methylene blue (MBAS) by continuous flow analysis (CFA) method spectrophotometrically	CZ_SOP_D06_07_067 (ČSN ISO 16265, SKALAR Company methodology, ČSN EN 903)	Water ⁹¹ , extracts ⁹²
1.91 ¹	Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and calculation of nitrite nitrogen and nitrate nitrogen and sulphate sulphur from measured values including the calculation of total mineralization	CZ_SOP_D06_02_068 (ČSN EN ISO 10304-1)	Water ⁹¹ , extracts ⁹²
1.92	Reserved		
1.93 ¹	Determination of dry suspended solids and annealed suspend solids by gravimetry and calculation of loss of ignition of suspend solids and total solids from measured values	CZ_SOP_D06_02_070 (ČSN EN 872, ČSN 757350, SM 2540 D, SM 2540 E)	Water ⁹¹ , extracts ⁹²
1.94 ¹	Determination of dissolved solids (RL) and dissolved solid annealed (RAS) using glass fibre filters by gravimetry and calculation of loss on ignition of dissolved solids (RL550) from measured values	CZ_SOP_D06_02_071 (ČSN 75 7346, ČSN 757347, ČSN EN 15216, SM 2540 C, SM 2540 E)	Water ⁹¹ , extracts ⁹²
1.95 ¹	Determination of acid neutralizing capacity (alkalinity) by potentiometric titration and calculation of the carbonate hardness and CO ₂ forms from measured values including the calculation of total mineralization	CZ_SOP_D06_02_072 (ČSN EN ISO 9963-1, ČSN EN ISO 9963-2, ČSN 75 7373, SM 2320)	Water ⁹¹ , extracts ⁹²
1.96 ¹	Determination of base neutralizing capacity (acidity) by potentiometric titration	CZ_SOP_D06_02_073 (ČSN 75 7372)	Water ⁹¹ , extracts ⁹²
1.97 ¹	Determination of turbidity by optical turbidimeter	CZ_SOP_D06_02_074 (ČSN EN ISO 7027-1)	Water ⁹¹ , extracts ⁹²
1.98 ¹	Determination of electrical conductivity by conductometer and calculation of salinity	CZ_SOP_D06_02_075 (ČSN EN 27888, SM 2520 B)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸⁹
1.99 ¹	Determination of chemical oxygen demand using dichromate (COD _{Cr}) by photometry	CZ_SOP_D06_02_076 (ČSN ISO 15705)	Water ⁹¹ , extracts ⁹²
1.100	Reserved		
1.101 ¹	Determination of biochemical oxygen demand electrochemically after n days (BOD _n) by dilution method with allylthiourea addition	CZ_SOP_D06_02_077 (ČSN EN ISO 5815-1)	Water ⁹¹ , extracts ⁹²
1.102 ¹	Determination of biochemical oxygen demand electrochemically after n days (BOD _n) by method for undiluted samples	CZ_SOP_D06_02_078 (ČSN EN 1899-2, ISO 5815-2)	Water ⁹¹ , extracts ⁹²

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1.103 ¹	Determination of colour by spectrophotometry	CZ_SOP_D06_02_079 (ČSN EN ISO 7887)	Water ⁹¹ , extracts ⁹²
1.104 ¹	Determination of total phosphorus by discrete spectrophotometry and calculation of phosphorus as P ₂ O ₅ and PO ₄ ³⁻ from measured values	CZ_SOP_D06_02_080 (ČSN EN ISO 6878, ČSN EN ISO 15681-1)	Water ⁹¹ , extracts ⁹²
1.105 ¹	Determination of total nitrogen by discrete spectrophotometry after mineralization with peroxisulphate	CZ_SOP_D06_02_081 (ČSN EN ISO 11905-1)	Water ⁹¹ , extracts ⁹²
1.106 ²	Determination of chloride in absorption solution from emission sample of inorganic compounds of chlorine by potentiometric titration and calculation of hydrogen chloride from measured values	CZ_SOP_D06_07_082 (ČSN EN 1911)	Absorption solutions from emission sampling
1.107 ²	Determination of fluoride in absorption solution from emission sample of inorganic compounds of fluorine after separation by distillation by direct potentiometry and calculation of hydrogen fluoride from measured values	CZ_SOP_D06_07_083 (ČSN 83 4752-3:1989)	Absorption solutions from emission sampling
1.108	Reserved		
1.109 ²	Determination of ammonia in absorption solution from emission sample by photometry after distillation	CZ_SOP_D06_07_085 (ČSN 83 4728-4)	Absorption solutions from emission sampling
1.110 ¹	Determination of total solids by gravimetry	CZ_SOP_D06_02_086 (ČSN 75 7346, ČSN 757347, ČSN EN 872, SM 2540 B, C, D)	Water ⁹¹
1.111 ²	Determination of pH, temperature and electrical conductivity in extracts prepared by a bottom-up percolation test (under specific conditions)	CZ_SOP_D06_07_087 (ČSN EN 14405, ČSN ISO 10523, ČSN 75 7342, ČSN EN 27888)	Solid samples ⁸⁵
1.112 ^{1,2}	Determination of pH, temperature and electrical conductivity in extracts prepared by a two-stage batch test (under specific conditions)	CZ_SOP_D06_07_088 (ČSN EN 12457-3, ČSN ISO 10523, ČSN 75 7342, ČSN EN 27888)	Solid samples ⁸⁵
1.113 ¹	Determination of total cyanide by spectrophotometry and calculation of complex-forming cyanides from measured values	CZ_SOP_D06_02_089.A (ČSN 75 7415, ČSN EN ISO 14403-2)	Water ⁹¹ , extracts ⁹² , absorption solutions from emission sampling
1.114 ¹	Determination of total cyanide by spectrophotometry and calculation of complex-forming cyanides from measured values	CZ_SOP_D06_02_089.B (ČSN 75 7415, ČSN EN ISO 17380, ČSN EN ISO 14403-2, SM 4500 CN)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
1.115 ¹	Determination of easily releasable cyanide (free cyanide) and cyanide dissociated by weak acid by spectrophotometry	CZ_SOP_D06_02_090.A (ČSN ISO 6703-2, ČSN EN ISO 14403-2, SM 4500 CN)	Water ⁹¹ , extracts ⁹²

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1.116 ¹	Determination of easily releasable cyanide (free cyanide) and cyanide dissociated by weak acid by spectrophotometry	CZ_SOP_D06_02_090.B (ČSN 75 7415, ČSN EN ISO 17380, ČSN EN ISO 14403-2, SM 4500 CN)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
1.117 ¹	Determination of fluorides by electrochemical method (ISE)	CZ_SOP_D06_02_091 (ČSN ISO 10359-1)	Water ⁹¹ , extracts ⁹²
1.118 ¹	Determination of chemical oxygen demand using permanganate (COD _{Mn}) by titration	CZ_SOP_D06_02_092 (ČSN EN ISO 8467)	Water ⁹¹ , extracts ⁹²
1.119 ¹	Determination of bound nitrogen (TNb), following oxidation to nitrogen oxides by chemiluminescent detection	CZ_SOP_D06_02_094.A (ČSN EN 12260)	Water ⁹¹ , extracts ⁹²
1.120 ¹	Determination of bound nitrogen (TNb) following oxidation to nitrogen oxides by IR detection	CZ_SOP_D06_02_094.B (ČSN EN 12260)	Water ⁹¹ , extracts ⁹²
1.121 ¹	Qualitative determination of asbestos fibre by polarization microscope	CZ_SOP_D06_02_095 (NIOSH 9002)	Solid samples ⁸⁵ , (except liquid waste, biowaste), building materials ⁸⁹ , materials for building ⁸²
1.122 ¹	Determination of mercury by fluorescence spectrometry	CZ_SOP_D06_02_096 (US EPA 245.7, ČSN EN ISO 17852)	Water ⁹¹ , extracts ⁹²
1.123 ¹	Determination of mercury by fluorescence spectrometry	CZ_SOP_D06_02_096 (ČSN EN ISO 17852, PSA Application Note 025, ISO 16772:2004)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
1.124	Reserved		
1.125 ¹	Determination of mercury by fluorescence spectrometry	CZ_SOP_D06_02_096 (ČSN EN ISO 17852, ČSN EN 13211, ČSN EN ISO 12846)	Emission ⁷⁸ , imission ⁷⁹
1.126 – 1.127	Reserved		
1.128 ¹	Determination of dissolved bromate, chlorate and chlorite by ion liquid chromatography method and calculation of the sum of chlorate and chlorite from measured values	CZ_SOP_D06_02_098 (ČSN EN ISO 15061, ČSN EN ISO 10304-4)	Water ⁹¹ , extracts ⁹²
1.129 ¹	Determination of chloride by discrete spectrophotometry	CZ_SOP_D06_02_099 (US EPA 325.1, SM 4500-Cl ⁻)	Water ⁹¹ , extracts ⁹²
1.130 ¹	Determination of extractive substances by gravimetry	CZ_SOP_D06_02_100 (ČSN 75 7508, SM 5520B)	Water ⁹¹
1.131 ²	Determination of reactive and non-labile aluminium by continuous flow analysis (CFA) spectrophotometrically and calculation of labile aluminium from measured values	CZ_SOP_D06_07_101 (SKALAR Company method)	Drinking, surface water
1.132 ²	Determination of total nitrogen by modified Kjeldahl method by spectrophotometry	CZ_SOP_D06_07_102 (ČSN ISO 11261)	Solid samples ⁸⁵

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1.133* 1,2,3,4,5,6,7,8,9	Field measurement of oxidation-reduction potential (ORP) by potentiometry	CZ_SOP_D06_01_103 (ČSN 75 7367)	Water ⁹¹
1.134 ¹	Determination of grease and oils by gravimetry (extraction after evaporation)	CZ_SOP_D06_02_104 (ČSN 75 7509)	Water ⁹¹
1.135 ¹	Determination of pH by potentiometry	CZ_SOP_D06_02_105 (ČSN ISO 10523, US EPA 150.1, SM 4500-H-B)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸¹
1.136	Reserved		
1.137 ²	Determination of total nitrogen by modified Kjeldahl method by spectrophotometry	CZ_SOP_D06_07_107 (ČSN EN 25663, ČSN ISO 7150-1, SFS 5505)	Water ⁹¹ , extracts ⁹²
1.138 ¹	Determination of settleable solids by volumetry	CZ_SOP_D06_02_108 (SM 2540 F)	Water ⁹¹ , extracts ⁹²
1.139 ¹	Determination of dissolved silicates by discrete photometry and calculation of H ₂ SiO ₃ and total mineralization from measured values	CZ_SOP_D06_02_109 (ČSN EN ISO 16264, US EPA 370.1)	Water ⁹¹ , extracts ⁹²
1.140 ¹	Determination of chlorophyll by spectrophotometry	CZ_SOP_D06_02_110 (SM 10200 H)	Surface waters ⁸⁷
1.141	Reserved		
1.142 ²	Determination of phosphorus soluble in sodium hydrogen carbonate solution spectrophotometrically	CZ_SOP_D06_07_112 (ČSN ISO 11263)	Solid samples ⁸⁵
1.143 ²	Determination of pH electrochemically in a suspension in water, KCl, CaCl ₂ , BaCl ₂	CZ_SOP_D06_07_113 (ČSN ISO 10390, ČSN EN 12176:1999, ČSN EN 13037, ČSN EN 15933, ČSN 46 5735, ÖNORM L 1086-1, US EPA 9045D; US EPA 9040C)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
1.144 ²	Determination of formaldehyde by spectrophotometry	CZ_SOP_D06_07_114 (Chemical and physical methods of water analysis, SNTL Prague 1989)	Water ⁹¹ , extracts ⁹²
1.145	Reserved		
1.146 ²	Determination of iron(II) by spectrophotometry	CZ_SOP_D06_07_116 (ČSN ISO 6332)	Water ⁹¹ , extracts ⁹²
1.147 ²	Determination of total carbon (TC), total organic carbon (TOC) by the combustion method with IR detection and calculation of total inorganic carbon (TIC), carbonates and organic matter from measured values	CZ_SOP_D06_07_117 (Elementar Company methodology, ČSN ISO 10694, ČSN EN 13137:2002, ČSN EN 15936)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
1.148 ²	Determination of permeability by falling head	CZ_SOP_D06_07_118 (ČSN EN ISO 17892-11, chap. 5.2.2.3)	Soil
1.149 ¹	Determination of aggressive carbon dioxide by the Heyer's method using calculation from alkalinity	CZ_SOP_D06_02_119 (ČSN 83 0530-14:2000)	Water ⁹¹

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
1.150 ²	Determination of graininess of solid samples by the combined method of suspension density, sieve analyses and laser diffraction and calculation of permeability from measured values according to USBSC	CZ_SOP_D06_07_120 (ČSN EN ISO 17892-4, ČSN EN 933-1, ČSN EN 933-2, BS ISO 11277, Instructions TOM 23/1, ISO 13320)	Solid samples ⁸⁵ (grain size lower than 63 mm)
1.151 ²	Determination of total carbon, total sulfur, and hydrogen by combustion method with IR detection, determination of total nitrogen by combustion method with TCD detection and calculation of oxygen from measured values	CZ_SOP_D06_07_121.A (LECO Company methodology, ČSN ISO 29541, ČSN EN ISO 16994, ČSN ISO 16948, ČSN ISO 19579, ČSN EN 15408, ČSN ISO 10694, ČSN EN ISO 21663)	Solid samples ⁸⁵ , waste, sludge, lubricants, feed ⁸³ , plants, digestates, solid fossil fuels, solid biofuels, solid recovered fuels, building materials ⁸² , materials for building ⁸⁹
1.152 ²	Determination of carbon, sulfur and hydrogen by combustion method with IR detection and determination of nitrogen by combustion method with TCD detection and calculation of oxygen from measured values	CZ_SOP_D06_07_121.B (LECO Company methodology)	Oil, liquid fuels, combustible liquid and solid wastes
1.153 ¹	Determination of hexavalent chromium by ion chromatography with spectrophotometric detection and calculation of trivalent chromium from measured values	CZ_SOP_D06_02_122, except chap. 10.2; 11.3.2; 11.5; 12.2.2; 15.5 (US EPA 7199, SM 3500-Cr)	Water ⁹¹ , extracts ⁹²
1.154 ¹	Determination of hexavalent chromium by ion chromatography with spectrophotometric detection and calculation of trivalent chromium from measured values	CZ_SOP_D06_02_122, except chap. 10.1; 11.3.1; 12.2.1; 15.4 (ČSN EN ISO 15192, EPA 3060A)	Solid samples ⁸⁵
1.155 – 1.156	Reserved		
1.157 ²	Determination of gross calorific value by calorimetric method and calculation of net calorific value and emission factor from measured values	CZ_SOP_D06_07_124.A (ČSN ISO 1928, ČSN EN ISO 18125, ČSN EN ISO 21654, ČSN EN 15170, ČSN DIN 51900-1, ČSN DIN 51900-2, ČSN DIN 51900-3, ČSN P CEN/TS 16023)	Solid fossil fuels, solid biofuels, solid recovered fuels, waste, sludge, combustible building materials ⁸⁹
1.158 ²	Determination of gross calorific value by calorimetric method and calculation of net calorific value and emission factor from measured values	CZ_SOP_D06_07_124.B (ČSN DIN 51900-1, ČSN DIN 51900-2, ČSN DIN 51900-3)	Oils, liquid fuels, combustible liquid, and solid wastes
1.159 ^{2,1}	Determination of total bromine, chlorine, fluorine, and sulphur by calculation from the measured values of bromide, chloride, fluoride and sulphate by IC method after burning the sample	CZ_SOP_D06_07_124.C (ČSN EN ISO 16994, ČSN EN 15408, ČSN EN 14582)	Solid fossil fuels, solid biofuels, solid recovered fuels, waste, sludge, combustible building materials ⁸⁹

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
1.160 ^{2,1}	Determination of total bromine, chlorine, fluorine and sulphur by calculation from the measured values of bromide, chloride, fluoride and sulphate by IC method after burning the sample	CZ_SOP_D06_07_124.D (ČSN DIN 51900-1, ČSN DIN 51900-2, ČSN DIN 51900-3)	Oils, liquid fuels, combustible liquid and solid wastes
1.161 ²	Determination of laboratory compacted bulk density (LCBD)	CZ_SOP_D06_07_125 (ČSN EN 13040)	Sludge, composts, soils meliorants and growth stimulants
1.162 ²	Determination of electrical conductivity	CZ_SOP_D06_07_126 (ČSN EN 13038, ČSN ISO 11265, ČSN P CEN/TS 15937)	Sludge, composts, soils, soils meliorants and growth stimulants, modified bio waste
1.163 ¹	Determination of hexavalent chromium by ion chromatography with spectrophotometric detection and calculation of trivalent chromium from measured values	CZ_SOP_D06_02_127 (ISO 16740, EPA 425)	Emission ⁷⁸ , imission ⁷⁹
1.164 ¹	Determination of nitrogen dioxide and sulphur dioxide in passive samplers by ion chromatography method and results recalculation to the volume of air	CZ_SOP_D06_02_128 (Materials of Institute Fondazione Salvatore Maugeri, ČSN EN ISO 10304-1, ČSN EN ISO 10304-3)	Emission ⁷⁸ , imission ⁷⁹
1.165 ¹	Determination of sulphite by ion chromatography method	CZ_SOP_D06_02_129 (ČSN EN ISO 10304-3)	Water ⁹¹ , extracts ⁹²
1.166 ²	Determination of volatile matter by gravimetry and calculation of fixed carbon from the measured values	CZ_SOP_D06_07_130 (ČSN ISO 562, ČSN ISO 5071-1, ČSN EN ISO 18123, ČSN EN ISO 22167)	Solid fossil fuels, solid biofuels, solid recovered fuels
1.167 ²	Determination of sulphite after distillation by titration	CZ_SOP_D06_07_131 (M. Horáková et al.: Chemical and physical methods of water analyses)	Water ⁹¹ , extracts ⁹²
1.168 ²	Determination of respiratory activity (ATa) using respirometer	CZ_SOP_D06_07_132 (ÖNORM S 2027-4)	Wastes, sludge, composts, soils
1.169* 1,2,4,6,7,8,9	Field determination of ozone using HACH sets	CZ_SOP_D06_01_133 (Method 8311 HACH Company, USA)	Drinking water, pool water Emission ⁷⁸
1.170 ¹	Determination of fluoride, chloride, and sulphate in absorption solution from emission sampling by ion chromatographic method and calculation of hydrogen fluoride, hydrogen chloride and sulphur dioxide from measured values	CZ_SOP_D06_02_134 (ČSN EN 1911, STN ISO 15713, ČSN EN 14791, ČSN EN ISO 10304-1)	
1.171 ¹	Determination of non-polar extractable compounds by UV spectrometry	CZ_SOP_D06_02_135, except chap. 10.2 (ČSN 83 0540-4:1998, STN 83 0540-4)	Water ⁹¹ , extracts ⁹²
1.172 ¹	Determination of non-polar extractable compounds by UV spectrometry	CZ_SOP_D06_02_135, except chap. 10.1 (ČSN 83 0540-4:1998, STN 83 0540-4)	Solid samples ⁸⁵

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
1.173 ¹	Determination of total dust concentration and respirable dust fraction by gravimetry and results recalculation to the volume of air	CZ_SOP_D06_02_136 (ČSN EN 481, ČSN EN 482, ČSN EN 689+AC, NIOSH 0500, NIOSH 0600, GR No. 361/2007 Coll.)	Working environment ⁸⁷
1.174 ²	Determination of SiO ₂ in silicate materials after decomposition by gravimetry	CZ_SOP_D06_07_137 (ČSN 72 0105-1)	Solid samples ⁸⁵
1.175 ²	Determination of P ₂ O ₅ in silicate materials after decomposition by spectrophotometry	CZ_SOP_D06_07_138 (ČSN 72 0116-1)	Solid samples ⁸⁵
1.176 ²	Determination of total sulfur in silicate materials after decomposition by gravimetry	CZ_SOP_D06_07_139 (ČSN 72 0118)	Solid samples ⁸⁵
1.177	Reserved		
1.178* 1,2,3	Analysis of CH ₄ , CO ₂ , O ₂ , H ₂ S gases by Geotech gas analyzer and calculation of N ₂ from measured values	CZ_SOP_D06_01_141 (BIOGAS 5000 Analyzer Manual)	Gases ⁸⁶
1.179	Reserved		
1.180 ²	Determination of total inorganic fluorine after separation by distillation by direct potentiometry	CZ_SOP_D06_07_143, except chap. 10 and 13.1 (ČSN ISO 10359-2, ČSN 83 4752-3:1989)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸¹
1.181 ²	Determination of total inorganic fluorine after separation by distillation by direct potentiometry	CZ_SOP_D06_07_143 (ČSN ISO 10359-2, ČSN 83 4752-3:1989)	Solid samples ⁸⁵
1.182 ²	Determination of biomass content by selective dissolution	CZ_SOP_D06_07_144 (ČSN EN 15440, Annex A)	Solid alternative fuels, solid combustible wastes
2	Organic Chemistry		
2.1 ¹	Determination of extractable compounds in the range of hydrocarbons C10 – C40, their fractions calculated from the measured values by gas chromatography method with FID detection	CZ_SOP_D06_03_150 (ČSN EN 14039, ČSN EN ISO 16703, ČSN P CEN ISO/TS 16558-2, US EPA 8015, US EPA 3550, TNRCC Method 1006)	Solid samples ⁸⁵
2.2 ¹	Determination of extractable compounds in the range of hydrocarbons C10 – C40, their fractions calculated from the measured values by gas chromatography method with FID detection	CZ_SOP_D06_03_151 (ČSN EN ISO 9377-2, US EPA 8015, US EPA 3510, TNRCC Method 1006)	Water ⁹¹ , extracts ⁹²
2.3 ¹	Determination of extractable compounds in the range of hydrocarbons C5 – C40, their fractions calculated from the measured values by gas chromatography method with FID detection	CZ_SOP_D06_03_152, except chap. 9.1 (TNRCC Method 1006, TNRCC Method 1005)	Water ⁹¹ , extracts ⁹² , liquid samples ⁸¹
2.4 ¹	Determination of extractable compounds in the range of hydrocarbons C5 – C40, their fractions calculated from the measured values by gas chromatography method with FID detection	CZ_SOP_D06_03_152, except chap. 9.2 (TNRCC Method 1006, TNRCC Method 1005)	Solid samples ⁸⁵

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
2.5 ¹	Determination of volatile organic compounds ¹⁹ by gas chromatography method with FID and MS detection and calculation of volatile organic compounds sums from measured values and results recalculation to the volume of air	CZ_SOP_D06_03_153 (CEN/TS 13649, NIOSH ¹¹)	Solid sorbents
2.6	Reserved		
2.7 ¹	Determination of volatile organic compounds ⁵ by gas chromatography method with FID and MS detection and calculation of volatile organic compounds sums from measured values	CZ_SOP_D06_03_155 except chap. 10.5 and 10.6 (US EPA 624, US EPA 5021A, US EPA 8260, US EPA 8015, ČSN EN ISO 10301, MADEP 2004, rev. 1.1, ČSN ISO 11423, ČSN EN ISO 15680)	Water ⁹¹ , extracts ⁹²
2.8 ¹	Determination of volatile organic compounds ⁴ by gas chromatography method with FID and MS detection and calculation of volatile organic compounds sums from measured values	CZ_SOP_D06_03_155, except chap. 10.4 (US EPA 8260, US EPA 5021A, US EPA 5021, US EPA 8015, ČSN EN ISO 22155, ČSN EN ISO 15009, ČSN EN ISO 16558-1, MADEP 2004, rev. 1.1.)	Solid samples ⁸⁵
2.9 ¹	Determination of volatile organic compounds ⁴ by gas chromatography method with FID and ECD detection and calculation of volatile organic compounds sums from measured values	CZ_SOP_D06_03_156, except chap. 11.3 - 11.5 (US EPA 601, US EPA 8260, US EPA 8015, RBCA Petroleum Hydrocarbon Methods, ČSN EN ISO 11423, ČSN EN ISO 15680)	Water ⁹¹ , extracts ⁹²
2.10 ¹	Determination of volatile organic compounds ⁴ by gas chromatography method with FID and ECD detection and calculation of volatile organic compounds sums from measured values	CZ_SOP_D06_03_156, except chap. 11.1 and 11.2 (US EPA 8260, US EPA 8015, ČSN EN ISO 22155, ČSN EN ISO 15009, ČSN EN ISO 16558-1, RBCA Petroleum Hydrocarbon Methods)	Solid samples ⁸⁵
2.11 ¹	Determination of organic contaminants ⁵ by gas chromatography method with MS detection (SPIMFAB) and calculation of organic contaminants sums from measured values	CZ_SOP_D06_03_157, except chap. 9.2 (SPIMFAB)	Water ⁹¹ , extracts ⁹²

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
2.12 ¹	Determination of organic contaminants ⁵ by gas chromatography method with MS detection (SPIMFAB) and calculation of organic contaminants sums from measured values	CZ_SOP_D06_03_157, except chap. 9.1 (SPIMFAB)	Waste (solid waste, biowaste), sediments, soil, rocks
2.13 ¹	Determination of phenols, chlorinated phenols and cresols ⁶ by gas chromatography method with MS and ECD detection and calculation of phenols, chlorinated phenols and cresols sums from measured values	CZ_SOP_D06_03_158, except chap. 9.3 and 9.4 (US EPA 8041, US EPA 3500, ČSN EN 12673)	Water ⁹¹
2.14 ¹	Determination of phenols, chlorinated phenols and cresols ⁶ by gas chromatography method with MS and ECD detection and calculation of phenols, chlorinated phenols and cresols sums from measured values	CZ_SOP_D06_03_158, except chap. 9.1, 9.2 and 9.4 (US EPA 8041, US EPA 3500, DIN ISO 14154)	Building materials ⁸² , materials for building ⁸⁹ , waste (solid waste, biowaste), sediments, soil, rocks
2.15	Reserved		
2.16 ¹	Determination of phthalates ⁷ by gas chromatography method with MS detection and calculation of phthalates sums from measured values	CZ_SOP_D06_03_159, except chap. 9.2 and 9.3 (US EPA 8061A)	Water ⁹¹ , extracts ⁹²
2.17 ¹	Determination of phthalates ⁷ by gas chromatography method with MS detection and calculation of phthalates sums from measured values	CZ_SOP_D06_03_159, except chap. 9.1 (US EPA 8061A, CPSC-CH-C1001-09.3)	Building materials ⁸² , materials for building ⁸⁹ , waste (solid waste, biowaste), sediments, soil, rocks
2.18 ¹	Determination of phenols and cresols ⁶⁰ by gas chromatography method with MS detection and calculation of phenols and cresols sums from measured values	CZ_SOP_D06_03_160, except chap. 9.2 (US EPA 8041A, US EPA 3500)	Water ⁹¹ , extracts ⁹²
2.19 ¹	Determination of phenols and cresols ⁶⁰ by gas chromatography method with MS detection and calculation of phenols and cresols sums from measured values	CZ_SOP_D06_03_160, except chap. 9.1 (US EPA 8041A, US EPA 3500)	Building materials ⁸² , materials for building ⁸⁹ , waste (solid waste, biowaste), sediments, soil, rocks
2.20 ¹	Determination of semi volatile organic compounds ⁸ by gas chromatography method with MS or MS/MS detection and calculation of semi volatile organic compounds sums from measured values	CZ_SOP_D06_03_161 except chap. 10.1.3 – 10.1.5 (US EPA 8270D, US EPA 8082A, ČSN EN ISO 6468, US EPA 8000D)	Water ⁹¹ , extracts ⁹²
2.21 ¹	Determination of semi volatile organic compounds ⁸ by gas chromatography method with MS or MS/MS detection and calculation of semi volatile organic compounds sums from measured values	CZ_SOP_D06_03_161 except chap. 10.1.1, 10.1.2, 10.2.1, 10.2.2 (US EPA 8270D, US EPA 8082A, ČSN EN 15527, ISO 18287, ISO 10382, ČSN EN 17322)	Building materials ⁸² , materials for building ⁸⁹ , waste (solid waste, biowaste), sediments, soil, rocks

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
2.22 ¹	Determination of polycyclic aromatic hydrocarbons ⁹ by liquid chromatography method with FLD and PDA detection and calculation of polycyclic aromatic hydrocarbons sums from measured values	CZ_SOP_D06_03_162 (US EPA 550)	Drinking, table and infant water
2.23 ¹	Determination of polycyclic aromatic hydrocarbons ¹⁰ by liquid chromatography method with detection FLD and PDA and calculation of polycyclic aromatic hydrocarbons sums from measured values	CZ_SOP_D06_03_163, except chap. 9.1.2, 9.4.2 (US EPA 610, ČSN EN ISO 17993)	Water ⁹¹ , extracts ⁹²
2.24 ¹	Determination of polycyclic aromatic hydrocarbons ¹⁰ by liquid chromatography method with FLD and PDA detection and calculation of polycyclic aromatic hydrocarbons sums from measured values	CZ_SOP_D06_03_163, except chap. 9.1.1, 9.4.1 (US EPA 610, US EPA 3550, ČSN EN 16181)	Solid samples ⁸⁵
2.25 ¹	Determination of glycols ²⁸ by gas chromatography method with MS detection	CZ_SOP_D06_03_164	Water ⁹¹ , cooling liquids, anti-freeze fluid
2.26 ¹	Determination of polycyclic aromatic hydrocarbons ¹⁰ by liquid chromatography method with FLD and PDA detection and calculation of polycyclic aromatic hydrocarbons sums from measured values and results recalculation to the volume of air	CZ_SOP_D06_03_165 (ISO 11338-2)	Emission ⁷⁸ , imission ⁷⁹
2.27 ¹	Determination of polychlorinated biphenyls ³⁹ by gas chromatography method with ECD detection and calculation of polychlorinated biphenyls sums from measured values	CZ_SOP_D06_03_166 except chap. 10.1 – 10.3 (DIN 38407-3, US EPA 8082)	Water ⁹¹ , extracts ⁹²
2.28 ¹	Determination of polychlorinated biphenyls ¹¹ by gas chromatography method with ECD detection and calculation of polychlorinated biphenyls sums from measured values	CZ_SOP_D06_03_166 except chap. 10.4 (US EPA 8082, ISO 10382, ČSN EN 17322)	Solid samples ⁸⁵ , sealing materials
2.29 ¹	Determination of alkylphenols and alkylphenol ethoxylates ²⁴ by gas chromatography method with MS or MS/MS detection and calculation of alkylphenols and alkylphenol ethoxylates sums from measured values	CZ_SOP_D06_03_167 (European Standard BT WI CSS99040)	Sediments, soils, rocks
2.30 ¹	Determination of polychlorinated biphenyls ¹¹ - congener analyses by gas chromatography method with ECD detection and calculation of polychlorinated biphenyls sums from measured values	CZ_SOP_D06_03_168 (ČSN EN 12766-1, ČSN EN 61619)	Oil hydrocarbons, used oils, insulating liquids
2.31 ¹	Determination of organochlorine pesticides and other halogen compounds ¹² by gas chromatography method with ECD detection and calculation of organochlorine pesticides and other halogen compounds sums from measured values	CZ_SOP_D06_03_169 except chap. 10.1 (ČSN EN ISO 6468, US EPA 8081, DIN 38407-3)	Water ⁹¹ , extracts ⁹²

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
2.32 ¹	Determination of organochlorine pesticides and other halogen compounds ¹² by gas chromatography method with ECD detection and calculation of organochlorine pesticides and other halogen compounds sums from measured values	CZ_SOP_D06_03_169 except chap. 10.2 (US EPA 8081, ISO 10382)	Solid samples ⁸⁵
2.33 ¹	Determination of perchlorates by liquid chromatography with MS/MS detection	CZ_SOP_D06_03_170.A (US EPA 6850)	Drinking water
2.34 ¹	Determination of perchlorates by liquid chromatography with MS/MS detection	CZ_SOP_D06_03_170.B (US EPA 6850)	Sediments, sludges, soils, rocks
2.35 ³	Determination of polychlorinated dibenzo-p-dioxins and dibenzofuranes ¹³ in emissions by isotope dilution method using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_170 (US EPA 23, US EPA 23A)	Emission ⁷⁸
2.36 ³	Determination of polychlorinated dibenzo-p-dioxins and dibenzofuranes ¹³ in immission by isotope dilution method using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_171 (US EPA TO-9A)	Imission ⁷⁹
2.37 ³	Determination of coplanar polychlorinated biphenyls ¹⁴ in stationary emission sources by isotope dilution method using HRGC-HRMS and calculation of PCB sums and TEQ parameter from measured values	CZ_SOP_D06_06_172 (IIS K 0311)	Emission ⁷⁸ , imission ⁷⁹
2.38 ³	Determination of polychlorinated biphenyls ¹⁴ by isotope dilution method using HRGC-HRMS and calculation of PCB sums and TEQ parameter from measured values	CZ_SOP_D06_06_173, except chap. 10.2.3.2-10.2.3.8, 10.2.4, 10.2.5 (US EPA 1668A, ČSN EN 16190)	Water ⁹¹
2.39 ³	Determination of polychlorinated biphenyls ¹⁴ by isotope dilution method using HRGC-HRMS and calculation of PCB sums and TEQ parameter from measured values	CZ_SOP_D06_06_173, except chap. 10.2.3.1, 10.2.3.7, 10.2.3.8, 10.2.5 (US EPA 1668A, ČSN EN 16190)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
2.40 ³	Determination of polychlorinated biphenyls ¹⁴ by isotope dilution method using HRGC-HRMS and calculation of PCB sums and TEQ parameter from measured values	CZ_SOP_D06_06_173, except chap. 10.2.3.1-10.2.3.7, 10.2.4 (US EPA 1668A, ČSN EN 16190)	Biological materials ⁷⁷ , vegetable materials ⁸⁸ , animal materials ⁹³
2.41 ³	Determination of polychlorinated biphenyls ¹⁴ by isotope dilution method using HRGC-HRMS and calculation of PCB sums and TEQ parameter from measured values	CZ_SOP_D06_06_173, except chap. 10.2.3.1-10.2.3.6 (US EPA 1668A, ČSN EN 16190)	SPMD, food, feed ⁸¹ , biotic materials
2.42 ³	Determination of polychlorinated dibenzo-p-dioxins and dibenzofuranes ¹³ in emission samples by isotope dilution method using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_174 (ČSN EN 1948-2, ČSN EN 1948-3)	Emission ⁷⁸

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
2.43 ³	Determination of tetra- to octa-chlorinated dioxins and furanes ¹³ by isotope dilution method using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_175, except chap. 10.2.3.2 - 10.2.3.8, 10.2.4, 10.2.5 (US EPA 1613B, ČSN EN 16190)	Water ⁹¹
2.44 ³	Determination of tetra- to octa-chlorinated dioxins and furanes ¹³ by isotope dilution method using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_175, except chap. 10.2.3.1, 10.2.3.7, 10.2.3.8, 10.2.5 (US EPA 1613 B, ČSN EN 16190)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
2.45 ³	Determination of tetra- to octa-chlorinated dioxins and furanes ¹³ by isotope dilution method using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_175, except chap. 10.2.3.1 - 10.2.3.7, 10.2.4 (US EPA 1613B, ČSN EN 16190)	Biological materials ⁷⁷ , vegetable materials ⁸⁸ , animal materials ⁹³
2.46 ³	Determination of tetra- to octa-chlorinated dioxins and furanes ¹³ by isotope dilution method using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_175 except chap. 10.2.3.1 - 10.2.3.6 (US EPA 1613B, ČSN EN 16190)	SPMD, food, feed ⁸³ , biotic materials
2.47 ³	Determination of polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF) ¹³ using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_176, except chap. 10.2.3.2 - 10.2.3.7, 10.2.4, 10.2.5 (US EPA 8290A)	Water ⁹¹
2.48 ³	Determination of polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF) ¹³ using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_176, except chap. 10.2.3.1, 10.2.3.6, 10.2.5 (US EPA 8290A)	Solid samples ⁸⁵
2.49 ³	Determination of polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF) ¹³ using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_176, except chap. 10.2.3.1 - 10.2.3.6, 10.2.4 (US EPA 8290A)	Biological materials ⁷⁷
2.50 ³	Determination of polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF) ¹³ using HRGC-HRMS and calculation of TEQ parameters from measured values	CZ_SOP_D06_06_176, except chap. 10.2.3.1 - 10.2.3.6 (US EPA 8290A)	Food, feed ⁸³ , biotic materials
2.51 ³	Determination of selected brominated flame retardants (BFR) ¹⁵ by isotope dilution method using HRGC-HRMS and calculation of brominated flame retardants sums from measured values	CZ_SOP_D06_06_177, except chap. 10.2.3.2 - 10.2.3.8, 10.2.4, 10.2.5 (US EPA 1614)	Water ⁹¹
2.52 ³	Determination of selected brominated flame retardants (BFR) ¹⁵ by isotope dilution method using HRGC-HRMS and calculation of brominated flame retardants sums from measured values	CZ_SOP_D06_06_177, except chap. 10.2.3.1, 10.2.3.7, 10.2.3.8, 10.2.5 (US EPA 1614, ČSN EN 16377, ČSN EN ISO 22032)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
2.53 ³	Determination of selected brominated flame retardants (BFR) ¹⁵ by isotope dilution method using HRGC-HRMS and calculation of brominated flame retardants sums from measured values	CZ_SOP_D06_06_177, except chap. 10.2.3.1 - 10.2.3.7, 10.2.4 (US EPA 1614)	Biological materials ⁷⁷ , vegetable materials ⁸⁸ , animal materials ⁹³
2.54 ³	Determination of selected brominated flame retardants (BFR) ¹⁵ by isotope dilution method using HRGC-HRMS and calculation of brominated flame retardants sums from measured values	CZ_SOP_D06_06_177, except chap. 10.2.3.1 - 10.2.3.6, (US EPA 1614)	SPMD, food, feed ⁸³ , biotic materials
2.55 ¹	Determination of alkylphenols and alkylphenol ethoxylates ⁴⁶ by gas chromatography method with MS or MS/MS detection and calculation of alkylphenols and alkylphenol ethoxylates sums from measured values	CZ_SOP_D06_03_178 (ČSN EN ISO 18857-2)	Water ⁹¹ , extracts ⁸²
2.56 ³	Determination of PCB ¹⁴ in emission samples by isotope dilution method using HRGC-HRMS and calculation of PCB sums from measured values	CZ_SOP_D06_06_179 (ČSN EN 1948-4, US EPA TO-4-A)	Emission ⁷⁸ , imission ⁷⁹ , working environment ⁸⁷
2.57 ³	Determination of polycyclic aromatic hydrocarbons ⁴⁴ by isotope dilution method using HRGC-HRMS and calculation of the sums of polycyclic aromatic hydrocarbons from the measured values	CZ_SOP_D06_06_180 except chap. 10.3.3.1 - 10.3.3.6, 10.3.3.8 - 10.3.3.10, 10.3.5 (US EPA 429, ISO 11338, US EPA 3540)	Solid samples ⁸⁵ , building materials ⁸² , materials for building ⁸⁹
2.58 ³	Determination of polycyclic aromatic hydrocarbons ⁴⁴ by isotope dilution method using HRGC-HRMS and calculation of the sums of polycyclic aromatic hydrocarbons from the measured values	CZ_SOP_D06_06_180, except chap. 10.3.3.6 - 10.3.3.10, 10.3.4, 10.3.5 (US EPA 429, ISO 11338, US EPA TO-13A, ČSN EN 15549)	Emission ⁷⁸ , imission ⁷⁹ , working environment ⁸⁷
2.59 ³	Determination of polycyclic aromatic hydrocarbons ⁴⁴ by isotope dilution method using HRGC-HRMS and calculation of polyaromatic hydrocarbons sums from measured values	CZ_SOP_D06_06_180, except chap. 10.3.3.1 - 10.3.3.9, 10.3.4 (US EPA 429, STN EN 16619)	Biological materials ⁷⁷ , vegetable materials ⁸⁸ , animal materials ⁹³
2.60 ³	Determination of polycyclic aromatic hydrocarbons ⁴⁴ by isotope dilution method using HRGC-HRMS and calculation of polyaromatic hydrocarbons sums from measured values	CZ_SOP_D06_06_180, except chap. 10.3.3.1 - 10.3.3.8 (US EPA 429, STN EN 16619)	SPMD, food, feed ⁸³ , biotic materials
2.61 ³	Determination of polycyclic aromatic hydrocarbons ⁴⁴ by isotope dilution method using HRGC-HRMS and calculation of polyaromatic hydrocarbons sums from measured values	CZ_SOP_D06_06_180, except chap. 10.3.3.1 - 10.3.3.7, 10.3.3.9, 10.3.3.10, 10.3.4, 10.3.5 (US EPA 429, ISO 11338, IP 346)	Oils

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
2.62 ¹	Determination of semi-volatile organic compounds ⁷ by gas chromatography method with MS detection and calculation of semi-volatile organic compounds sums from measured values	CZ_SOP_D06_03_181 (US EPA 429, US EPA 1668, US EPA 3550)	Sediments, soils, rocks
2.63 ¹	Determination of acidic herbicides, drug residues and other pollutants ²⁹ by liquid chromatography method with MS/MS detection and calculation of acidic herbicides, drug residues and other pollutants sums from measured values	CZ_SOP_D06_03_182.A (DIN 38407:35)	Water ⁹¹
2.64 ¹	Determination of acidic herbicides and drug residues ¹⁷ by liquid chromatography method with MS/MS detection	CZ_SOP_D06_03_182.B (ČSN EN 15637, US EPA 1694)	Sediments, sludges, soils, rocks
2.65 ¹	Determination of pesticides, pesticide metabolites, drug residues and other pollutants ³⁰ by liquid chromatography method with MS/MS detection and calculation of pesticides, pesticide metabolites, drug residues and other pollutants sums from measured values	CZ_SOP_D06_03_183.A (US EPA 535, US EPA 1694)	Water ⁹¹
2.66 ¹	Determination of pesticides, pesticide metabolites, drug residues and other pollutants ⁷⁰ and ⁷¹ by liquid chromatography method with MS/MS detection and calculation of pesticides, pesticides metabolites, drug residues and other pollutants sums from measured values	CZ_SOP_D06_03_183.B (ČSN EN 15637, US EPA 1694)	Sediments, sludges, soils, rocks, building materials ⁸² , materials for building ⁸⁹
2.67 ¹	Determination of pesticides, pesticide metabolites, drug residues and other pollutants ⁷² by liquid chromatography method with MS/MS detection and calculation of pesticides, pesticides metabolites, drug residues and other pollutants sums from measured values	CZ_SOP_D06_03_183.C (ČSN EN 15662)	Vegetal materials ⁸⁸ , animal materials ⁹³
2.68 ¹	Determination of pesticides ¹¹ by gas chromatography method with MS or MS/MS detection and calculation of pesticides sums from measured values	CZ_SOP_D06_03_184 (US EPA 8141B, US EPA 3535A, ČSN EN 12918)	Water ⁹¹
2.69 ¹	Determination of pesticides and pesticide metabolites ¹² by derivatization and liquid chromatography method with MS/MS detection and calculation of pesticides and pesticide metabolites sums from measured values	CZ_SOP_D06_03_185.A (ČSN ISO 21458)	Water ⁹¹
2.70 ¹	Determination of pesticides and pesticide metabolites ⁸ by derivatization and liquid chromatography method with MS/MS detection	CZ_SOP_D06_03_185.B (Journal of Chromatography A, 1292 (2013) 132-141, EC Decision No. 2002/657/EC)	Sediments, sludges, soils, rocks
2.71 ¹	Determination of complexing substances ³³ by gas chromatography method with MS detection	CZ_SOP_D06_03_186 (ČSN EN ISO 16588)	Water ⁹¹
2.72 ¹	Determination of polycyclic aromatic hydrocarbons derivatives ³⁶ by liquid chromatography method with MS detection	CZ_SOP_D06_03_187 (Journal of Chromatography A, 1133 (2006) 241-247)	Emission ⁷⁸ , imission ⁷⁹

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
2.73 ¹	Determination of organic acids ³⁷ by capillary electrophoresis method with UV detection	CZ_SOP_D06_03_188.A (Luxem Company manual, Kudrjashova, M.: Capillary electrophoretic monitoring of microbial growth: determination of organic acids, COPYRIGHT 2004 Estonian Academy Publishers, June 2004 Source Volume: 53 Source Issue: 2, ISSN: 1406-0124)	Water ⁹¹
2.74 ¹	Determination of organic acids ³⁷ by capillary electrophoresis method with UV detection	CZ_SOP_D06_03_188.B (Luxem Company manual, Kudrjashova, M.: Capillary electrophoretic monitoring of microbial growth: determination of organic acids, COPYRIGHT 2004 Estonian Academy Publishers, June 2004 Source Volume: 53 Source Issue: 2, ISSN: 1406-0124)	Feed ⁸³ , composts, digestate
2.75 ¹	Determination of gases ³⁸ by gas chromatography method with detection FID and TCD	CZ_SOP_D06_03_189 (EPA Method RSK-175)	Water ⁹¹ , liquid samples ⁸¹
2.76 ¹	Low limit determination of volatile organic compounds ⁵ by gas chromatography method with MS detection and calculation of volatile organic compounds sums from measured values	CZ_SOP_D06_03_190, except chap. 12.1, 13.1.1, 13.1.2, 14.1, 16.1 (US EPA 5021, US EPA 8260)	Water ⁹¹
2.77 ¹	Low limit determination of volatile organic compounds ⁵ by gas chromatography method with MS detection and calculation of volatile organic compounds sums from measured values	CZ_SOP_D06_03_190, except chap. 12.2, 13.2.1, 13.2.2, 14.2, 16.2 (US EPA 5021, US EPA 8260)	Solid samples ⁸⁵
2.78 ¹	Determination of chlorinated alkanes ³⁴ by gas chromatography method with MS/MS detection	CZ_SOP_D06_03_192.A (ČSN EN ISO 12010)	Water ⁹¹
2.79 ¹	Determination of chlorinated alkanes ³⁴ by gas chromatography method with MS/MS detection	CZ_SOP_D06_03_192.B (ČSN EN ISO 12010, ČSN EN ISO 18635)	Building materials ⁸² , materials for building ⁸⁹ , sediments, soils
2.80 ¹	Determination of aniline and aniline derivatives ²¹ by gas chromatography method with MS detection	CZ_SOP_D06_03_193 (US EPA 8270)	Sediments, sludges, soils, rocks
2.81 ¹	Determination of chlorinated phenols ³⁵ by liquid chromatography method with MS/MS detection	CZ_SOP_D06_03_194 (2002/657/ES, 96/23/ES)	Water ⁹¹
2.82 ¹	Determination of drug residues ⁴⁶ by liquid chromatography with MS/MS detection and results recalculation to the volume of air	CZ_SOP_D06_03_195 (Jia Yu et al.: Biomed. Chromatogr. 2011; 25: 511-516)	Working environment ⁸⁷
2.83 ¹	Determination of epichlorohydrin by gas chromatography method with MS/MS detection	CZ_SOP_D06_03_196 (Agilent Technologies Application list 5990-6433EN)	Water ⁹¹
2.84 ¹	Determination of perfluorinated and brominated compounds ⁴⁸ by liquid chromatography with MS/MS detection	CZ_SOP_D06_03_197.A (US EPA 537, ČSN P CEN/TS 15968)	Water ⁹¹ , extracts ⁸²

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2.85 ¹	Determination of per fluorinated and brominated compounds ⁷³ by liquid chromatography with MS/MS detection	CZ_SOP_D06_03_197.B (DIN 38414-14)	Sediments, sludges, soils, rocks
2.86 ¹	Determination of volatile organic compounds ⁹⁹ by gas chromatography method with TCD and FID detection and calculation of volatile organic compounds percentage from measured values	CZ_SOP_D06_03_198 (ČSN EN ISO 11890-2)	Organic solvents
2.87 ³	Determination of fat by gravimetry	CZ_SOP_D06_06_199 (US EPA 1613)	Food, feed ⁴³ , biological materials ⁷⁷
2.88 ¹	Determination of 3-chloro-1,2-propanediol by gas chromatography method with MS detection	CZ_SOP_D06_03_200 (LMBG 52.02(1))	Spices
2.89 ¹	Determination of drug residues and narcotic and psychotropic substances ⁸⁰ by liquid chromatography method with MS/MS detection	CZ_SOP_D06_03_201.A (US EPA 1694)	Water ⁹¹
2.90 ¹	Determination of organic acids ⁸⁴ by gas chromatography method with FID detection	CZ_SOP_D06_03_202 (Determination of Volatile Fatty Acids in sewage sludge 1979 HMSO.ISBN 0-11-75462-4)	Digestates
2.91 ¹	Determination of polycyclic aromatic hydrocarbons ²⁴ by gas chromatography with MS/MS detection, calculation of sums of polycyclic aromatic hydrocarbons from measured values and conversion of results to air volume	CZ_SOP_D06_03_203 (ISO 11338-2, ČSN EN 15549)	Emission ⁷⁸ , imission ⁹⁹
3	Food Organic Chemistry		
3.1 ¹	Determination of fatty acids ¹⁸ by gas chromatography method with FID detection and calculation sum of SAFA, MUFA, PUFA, TFA, Omega 3, Omega 6 ³⁵	CZ_SOP_D06_04_202 (ČSN EN ISO 12966-1, ČSN EN ISO 12966-2)	Food, feed ⁴³ , dietary supplements
3.2 ¹	Determination of cholesterol by gas chromatography method with FID detection	CZ_SOP_D06_04_205 (Prof. ing. Jiří Davidek, MD. et al, Laboratory Manual of Food Analysis, Journal of Chromatography A.; 24 (1994); 672 (1-2): 267-272)	Fatty food, non-fatty food, dietary supplements
3.3 ¹	Determination of retinol and alpha tocopherol by liquid chromatography method with FLD detection	CZ_SOP_D06_04_206 (ČSN EN 12823-1, ČSN EN 12822)	Fats, fatty food, non-fatty food, dietary supplements, feed ⁴³ and premixes
3.4 ¹	Determination of vitamin C (ascorbic acid) by liquid chromatography method with PDA detection	CZ_SOP_D06_04_207 (ČSN EN 14130:2004)	Beverages, candy, non-fatty food, dietary supplements, fruit, vegetables
3.5 ¹	Determination of Soya protein by ELISA by commercial set	CZ_SOP_D06_04_208 (R-Biopharm Manual – Ridascreen FAST Soya)	Food, swap
3.6 ¹	Determination of substitute sweeteners ²³ by liquid chromatography method with PDA detection	CZ_SOP_D06_04_209 (ČSN EN 12856)	Beverages, milk products, jams, dietary supplements, fishes
3.7 ¹	Determination of caffeine, theobromine, and theophylline by liquid chromatography method with PDA detection	CZ_SOP_D06_04_210 (ČSN EN 12856)	Beverages, tea, coffee, cocoa, chocolate

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
3.8 ¹	Determination of preserving agents ²⁴ in food by liquid chromatography method with PDA detection	CZ_SOP_D06_04_211 (ČSN EN 12856)	Beverages, jams, vegetable and fruit sauces and pastes, mustard, fatty and milk products, dietary supplements
3.9 ¹	Determination of aflatoxin B ₁ , B ₂ , G ₁ and G ₂ by liquid chromatography method with FLD detection	CZ_SOP_D06_04_212 (ČSN EN 14123)	Food with low water content, beverages, feed ⁴³
3.10 ¹	Determination of the content of ochratoxin A by liquid chromatography method with FLD detection	CZ_SOP_D06_04_213 (ČSN EN 15829, ČSN EN 14133, ČSN EN 14132)	Food with low water content, beverages, dietary supplements, feed ⁴³
3.11 ¹	Determination of zearalenone by liquid chromatography method with FLD detection	CZ_SOP_D06_04_214 (ČSN EN 15850)	Cereals, feed ⁴³
3.12 ¹	Determination of aflatoxin M1 by liquid chromatography method with FLD detection	CZ_SOP_D06_04_215 (ČSN EN ISO 14501)	Milk, dried milk, and products from them
3.13 ¹	Determination of patulin by liquid chromatography method with PDA detection	CZ_SOP_D06_04_216 (ČSN EN 14177)	Food with high water content, dietary supplements, beverages
3.14 ¹	Determination of deoxynivalenol by liquid chromatography method with PDA detection	CZ_SOP_D06_04_217 (ČSN EN 15791, ČSN EN 15891)	Food with low water content, beverages, dietary supplements, feed ⁴³
3.15 ¹	Determination of vitamins B ₁ , B ₂ and B ₆ by liquid chromatography method with FLD detection	CZ_SOP_D06_04_218 (ČSN EN 14122, ČSN EN 14152, ČSN EN 14663)	Fats, fatty food, non-fatty food, feed ⁴³ , dietary supplements
3.16 ¹	Determination of folic acid by ELISA method by commercial set	CZ_SOP_D06_04_219 (R-Biopharm– Ridascreen Folic Acid Manual)	Food, feed ⁴³ , dietary supplements
3.17 ¹	Determination of biotin by ELISA method by commercial set	CZ_SOP_D06_04_220 (Demedtec Manual)	Milk, milk products, cereals and cereal products, non-alcoholic beverages, baby food, feed ⁴³ , dietary supplements
3.18 ¹	Determination of gliadin (gluten) by sandwich enzyme immunoassay ELISA Method by commercial set	CZ_SOP_D06_04_221.A (R-Biopharm– Ridascreen Gliadin Manual)	Fatty food, non-fatty food, dietary supplements, swabs
3.19 ¹	Determination of gliadin (gluten) by competitive immunoassay ELISA Method by commercial set	CZ_SOP_D06_04_221.B (R-Biopharm– Ridascreen Gliadin Manual)	Fermented and hydrolyzed foods and beverages ⁸⁰
3.20 ¹	Determination of casein allergen by ELISA method by commercial set	CZ_SOP_D06_04_222 (Bio-Check - Casein Check Manual)	Food, dietary supplements, swabs
3.21 ¹	Determination of β-lactoglobulin allergen by ELISA method with a commercial kit	CZ_SOP_D06_04_223 (Bio-Check– β-lactoglobulin Check Manual)	Food, dietary supplements, swabs
3.22 ¹	Determination of mustard allergen by ELISA method by commercial set	CZ_SOP_D06_04_224 (Bio-Check– Mustard Check Manual)	Food, dietary supplements, swabs

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3.23 ¹	Determination of niacin by liquid chromatography method with PDA detection	CZ_SOP_D06_04_225 (ČSN EN 15652)	Fatty food, non-fatty food, feed ⁴³ , dietary supplements
3.24 ¹	Determination of soya protein by ELISA method by commercial set	CZ_SOP_D06_04_226 (Biokits Neogen– Soya assay Biokits Manual)	Meat products
3.25 ¹	Determination of parabens contain by liquid chromatography method with PDA detection	CZ_SOP_D06_04_227 (HPLC for Food Analysis, Agilent Technologies 1996-2001)	Cosmetics
3.26 ¹	Determination of peanut protein allergen by ELISA method by commercial set	CZ_SOP_D06_04_228 (Bio-Check– Peanut Check Manual)	Fatty food, non-fatty food, feed ⁴³ , dietary supplements
3.27 ¹	Determination of fat-soluble vitamins (D2 and D3) by two-dimensional liquid chromatography method with PDA detection	CZ_SOP_D06_04_229 (AN-1069 Thermo – Application list)	Fats, fatty food, non-fatty food, dietary supplements, feed ⁴³ , premixes
3.28 ¹	Determination of Vitamin B12 by ELISA method by commercial set	CZ_SOP_D06_04_230 (R-Biopharm– Ridascreen Fast Vitamin B12 Manual)	Food, feed ⁴³ , dietary supplements
3.29 ¹	Determination of fat-soluble vitamins (vitamins A, E) by liquid chromatography method with FLD detection	CZ_SOP_D06_04_231 (ČSN EN 128 23-1, ČSN EN 128 22)	Cosmetic masks
3.30 ¹	Determination of water-soluble vitamins (vitamin C) by liquid chromatography method with PDA detection	CZ_SOP_D06_04_232 (ČSN EN 14130:2004)	Cosmetic masks
3.31 ¹	Determination of almond allergen by ELISA method by commercial set	CZ_SOP_D06_04_233 (Bio-Check– Almonde Check Manual)	Food, dietary supplements, swabs
3.32 ¹	Determination of hazelnut allergen by ELISA method by commercial set	CZ_SOP_D06_04_234 (Bio-Check– Hazelnut Check Manual)	Food, dietary supplements, swabs
3.33 ¹	Determination of egg allergen (egg white proteins) by ELISA method by commercial set	CZ_SOP_D06_04_235 (Bio-Check– Egg Check Manual)	Food, dietary supplements, swabs
3.34 ¹	Determination of milk allergen (casein and β-lactoglobulin proteins by ELISA method by commercial set	CZ_SOP_D06_04_236 (Bio-Check– Milk Check Manual)	Food, dietary supplements, swabs
3.35 ¹	Determination of sesame allergen by ELISA method by commercial set	CZ_SOP_D06_04_237 (Bio-Check– Sesame Check Manual)	Food, dietary supplements, swabs
3.36 ¹	Determination of pantothenic acid by liquid chromatography with PDA detection	CZ_SOP_D06_04_238	Dietary supplements
4	Water Microbiology		
4.1 ¹	Enumeration of mesophilic bacteria by cultivation	ČSN 75 7841	Surface, ground, waste, pool water
4.2 ¹	Enumeration of psychrophilic bacteria by cultivation	ČSN 75 7842	Surface, ground, waste, pool water
4.3 ¹	Enumeration of intestinal enterococci by membrane filtration	ČSN EN ISO 7899-2 STN EN ISO 7899-2	Drinking, bottled, pool, raw, treated ⁹⁰ , ground, surface, waste water
4.4 ¹	Enumeration of culturable microorganisms a) at 22 °C b) at 36 °C by cultivation	ČSN EN ISO 6222 STN EN ISO 6222	Drinking, bottled, natural, mineral, pool, raw, treated ⁹⁰ , ground water

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
4.5 ¹	Enumeration of thermotolerant coliform bacteria and <i>Escherichia coli</i> by membrane filtration	ČSN 75 7835	Drinking, surface, ground, pool, waste water
4.6 ¹	Enumeration of <i>Escherichia coli</i> and coliform bacteria by membrane filtration	ČSN EN ISO 9308-1 STN EN ISO 9308-1	Drinking, pool, bottled, raw, treated ⁹⁰ , ground water
4.7 ¹	Enumeration of <i>Pseudomonas aeruginosa</i> by membrane filtration	ČSN EN ISO 16266 STN EN ISO 16266	Drinking, bottled, natural mineral, pool, surface, waste water
4.8 ¹	Enumeration of coagulase-positive staphylococci (<i>Staphylococcus Aureus</i> and other species) by membrane filtration	ČSN EN ISO 6888-1 ČSN EN ISO 8199	Pool, surface, waste, drinking, ground water
4.9 ¹	Enumeration of <i>Candida</i> yeasts by membrane filtration	CZ_SOP_D06_04_258 (Hausler, J.: Microbiological Culture Methods of Quality Inspection, Volume III, 1995)	Pool, surface, waste water
4.10 ¹	Enumeration of <i>Clostridium perfringens</i> by membrane filtration	CZ_SOP_D06_04_259 (GR 252/2004 Coll., Annex 6, GR No. 354/2006 Coll., Annex.3)	Drinking, bottled, pool, natural mineral, raw, treated ⁹⁰ , ground water
4.11 ¹	Detection of <i>Salmonella</i> by membrane filtration	ČSN ISO 19250	Drinking, surface, ground, pool, waste water
4.12 ¹	Determination of bioseston by microscopy	ČSN 75 7712 STN 757711	Drinking, bottled, raw, treated ⁹⁰ , ground water
4.13 ¹	Determination of abioseston by microscopy	ČSN 75 7713 STN 757712	Drinking, bottled, raw, treated ⁹⁰ , ground water
4.14 ¹	Detection and enumeration of <i>Legionella</i> by cultivation and membrane filtration	ČSN EN ISO 11731	Water ⁹¹ , treated water ⁹⁰
4.15 ¹	Detection and enumeration of <i>Legionella</i> by cultivation	ČSN EN ISO 11731	Sediments, alluvium, growths
4.16 ¹	Detection and enumeration of <i>Legionella</i> by cultivation	ČSN EN ISO 11731	Swabs
4.17 ¹	Enumeration of Coliform bacteria by membrane filtration	ČSN 75 7837	Non-disinfected water
4.18 ¹	Enumeration of sulphite the spores of sulfite-reducing anaerobes (<i>Clostridium</i>) by membrane filtration	ČSN EN 26461-2	Water ⁹¹
4.19 ¹	Microbiological testing of water for haemodialysis. Enumeration of viable microorganisms	CZ_SOP_D06_04_266 (ČSN EN ISO 23500-3)	Dialysis water
4.20 ¹	Microbiological testing of dialysis fluid for haemodialysis. Enumeration of viable microorganisms	CZ_SOP_D06_04_267 (ČSN EN ISO 23500-5)	Dialysis fluid
4.21 ¹	Determination of the concentration of bacterial endotoxins by the LAL test: turbidimetric kinetic method	CZ_SOP_D06_04_268 (Ph. Eur. chapter 2.6.14)	Dialysis fluid, water purified, water highly purified, water for injection
4.22 ¹	Determination of the total number of microorganisms	CZ_SOP_D06_04_269 (Ph. Eur chapter 6.3.0008, 6.3.1927, 6.3.0169)	Water purified, water highly purified, water for injection

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4.23 ¹	Test for specific micro-organisms – Detection of <i>Pseudomonas Aeruginosa</i> bacteria	CZ_SOP_D06_04_270 (Ph. Eur chap. 6.3:0008, 6.3:1927, 6.3:0169)	Water purified, water highly purified, water for injection
5	Microbiology		
5.1 ¹	Enumeration of microorganisms by cultivation	ČSN EN ISO 4833-1	Food, feed ⁴³ , dietary supplements
5.2 ¹	Enumeration of coliform bacteria by cultivation	ČSN ISO 4832	Food, feed ⁴³ , dietary supplements
5.3 ¹	Enumeration of enterococci by cultivation	CZ_SOP_D06_04_302 (ČSN 56 0100:1994)	Food, feed ⁴³ , dietary supplements
5.4 ¹	Enumeration of <i>Bacillus cereus</i> by cultivation	ČSN EN ISO 7932	Food, feed ⁴³ , dietary supplements
5.5 ¹	Enumeration of coagulase-positive staphylococci (<i>Staphylococcus aureus</i> and other species) by cultivation	ČSN EN ISO 6888-1	Food, feed ⁴³ , dietary supplements
5.6 ¹	Enumeration of <i>Clostridium perfringens</i> by cultivation	ČSN EN ISO 7937	Food, feed ⁴³ , dietary supplements
5.7 ¹	Detection of <i>Salmonella</i> by cultivation	ČSN EN ISO 6579-1	Food, feed ⁴³ , dietary supplements
5.8 ¹	Detection of <i>Salmonella</i> by cultivation	CZ_SOP_D06_04_307, except chap. 9.1.2 (ČSN EN ISO 6579, AHEM No. 1/2008)	Sludge, bio waste, compost, substrates, soils
5.9 ¹	Detection of <i>Salmonella</i> by cultivation	CZ_SOP_D06_04_307, except chap. 9.1.1 (ČSN EN ISO 6579, AHEM No. 1/2008)	Biological materials ^{2,7}
5.10 ¹	Determination of inhibiting substances by Delvotest method	CZ_SOP_D06_04_308 (O.K. Servis BioPro Manual)	Milk
5.11 ¹	Detection of <i>Salmonella</i> by ELISA method - commercial set Solus Salmonella	CZ-SOP-D06_04_309 (Solus Manual)	Food, feed ⁴³ , dietary supplements
5.12 ¹	Enumeration of yeasts and moulds by cultivation	ČSN ISO 21527-1,2	Food, feed ⁴³ , dietary supplements
5.13 ¹	Detection of <i>Enterobacteriaceae</i> by cultivation	ČSN ISO 21528-1	Food, feed ⁴³ , dietary supplements
5.14 ¹	Enumeration of spore-forming microorganisms by cultivation	CZ_SOP_D06_04_312 (ČSN 56 0100:1994, Article 87)	Food, feed ⁴³
5.15 ¹	Detection of <i>Vibrio parahaemolyticus</i> and <i>Vibrio species</i> by cultivation	ČSN EN ISO 21872-1,2	Food, feed ⁴³
5.16 ¹	Enumeration of mesophilic lactic acid bacteria by cultivation	ČSN ISO 15214	Food, feed ⁴³ , dietary supplements
5.17 ¹	Detection of <i>Shigella spp.</i> by cultivation	ČSN EN ISO 21567	Food, feed ⁴³
5.18 ¹	Detection of <i>Campylobacter spp.</i> by cultivation	ČSN EN ISO 10272-1	Food, feed ⁴³
5.19 ¹	Detection of presumptive pathogenic <i>Yersinia enterocolitica</i> by cultivation	ČSN EN ISO 10273	Food, feed ⁴³
5.20 ¹	Enumeration of Enterobacteriaceae by cultivation	ČSN ISO 21528-2	Food, feed ⁴³ , dietary supplements
5.21 ¹	Enumeration of beta-glucuronidase-positive <i>Escherichia coli</i> by cultivation	ČSN ISO 16649-2	Food, feed ⁴³ , dietary supplements

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
5.22 ¹	Detection and enumeration of <i>Listeria monocytogenes</i> by cultivation	ČSN EN ISO 11290-1 ČSN EN ISO 11290-2	Food, feed ⁴³ , dietary supplements
5.23 ¹	Enumeration of potentially toxigenic moulds on special media by cultivation	CZ_SOP_D06_04_321 (AHEM No. 1/2003)	Food, feed ⁴³
5.24 ¹	Enumeration of microorganisms in air by aeroscopy and sedimentation method	CZ_SOP_D06_04_322 (ČSN 56 0100:1994, Article 149, 150 AHEM No. 1/2002)	Internal air environment
5.25 ¹	Determination of microbial contamination of areas, surface of equipment and packages using swab method	CZ_SOP_D06_04_323 (ČSN 56 0100:1994, Article 145)	Areas, surface, packaging materials, surface of food
5.26 ¹	Enumeration of thermotolerant coliform bacteria and <i>Escherichia coli</i> by cultivation	CZ_SOP_D06_04_324 (AHEM No. 1/2008, ČSN ISO 16649-2)	Sludge, bio waste, compost, substrates, soils, sand
5.27 ¹	Enumeration of enterococci by cultivation	CZ_SOP_D06_04_325 (AHEM No. 1/2008, ČSN EN ISO 7899-2)	Sludge, bio waste, compost, substrates, soils, sand
5.28 ¹	Detection of <i>Listeria</i> by ELISA method - commercial set Solus Listeria	CZ_SOP_D06_04_326 (Solus Manual)	Food, feed ⁴³ , dietary supplements
5.29 ¹	Determination of the number of coagulase-positive staphylococci (<i>Staphylococcus aureus</i> and other species) - method of detection	ČSN EN ISO 6888-3	Food, feed ⁴³ , dietary supplements
5.30 ¹	Determination of low numbers of <i>Bacillus cereus</i> - method of detection	ČSN EN ISO 21871	Food, feed ⁴³ , dietary supplements
5.31 ¹	Detection of <i>Cronobacter (Enterobacter) sakazakii</i> by cultivation	ČSN EN ISO 22964	Milk and milk products
5.32 ¹	Detection and enumeration of aerobic mesophilic bacteria by cultivation	ČSN EN ISO 21149	Cosmetics
5.33 ¹	Detection of <i>Pseudomonas aeruginosa</i> by cultivation	ČSN EN ISO 22717 ČSN EN ISO 18415	Cosmetics
5.34 ¹	Detection of <i>Staphylococcus aureus</i> by cultivation	ČSN EN ISO 22718 ČSN EN ISO 18415	Cosmetics
5.35 ¹	Detection of <i>Candida albicans</i> by cultivation	ČSN EN ISO 18416 ČSN EN ISO 18415	Cosmetics
5.36 ¹	Detection of <i>Escherichia coli</i> by cultivation	ČSN EN ISO 21150 ČSN EN ISO 18415	Cosmetics
5.37 ¹	Enumeration of yeast and mould by cultivation	ČSN EN ISO 16212	Cosmetics
5.38 ¹	Evaluation of antimicrobial protection of cosmetic product, test of conservation effectiveness	CZ_SOP_D06_04_336 (ČSN EN ISO 11930, Ph. Eur., chapter 5.1.3)	Cosmetics
5.39 ¹	Horizontal method for the detection and enumeration of presumptive <i>Escherichia coli</i> - Technique of most probable number	ČSN ISO 7251 expect article 9.2	Food, feed ⁴³
5.40 ¹	Microbiological testing of non-sterile products – Determination of the number of microorganisms	CZ_SOP_D06_04_338 (Ph. Eur., chapter 2.6.12)	Pharmaceutical products, intermediates, raw materials, veterinary medicines, biopreparations, dietary supplements
5.41 ¹	Microbiological testing of non-sterile products – Tests for specific micro-organisms	CZ_SOP_D06_04_339 (Ph. Eur., chapter 2.6.13)	Pharmaceutical products, intermediates, raw materials.

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
			veterinary medicines, biopreparations, dietary supplements
6	Ecotoxicology		
6.1 ²	Determination of the acute lethal toxicity of substance to a freshwater fish	CZ_SOP_D06_07_350 (ČSN EN ISO 7346-1, ČSN EN ISO 7346-2, STN 83 8303)	Surface, ground and waste water ⁴⁴ , extracts of waste, solutions and extracts of chemical substances and agents
6.2 ²	Determination of the inhibition of the mobility of <i>Daphnia magna Straus</i> - Acute toxicity test	CZ_SOP_D06_07_351 (ČSN EN ISO 6341, STN 83 8303)	Surface, ground and waste water ⁴⁴ , extracts of waste, solutions and extracts of chemical substances and agents
6.3 ²	Freshwater algal growth inhibition test	CZ_SOP_D06_07_352 (ČSN EN ISO 8692, STN 83 8303)	Surface, ground and waste water ⁴⁴ , extracts of waste, solutions and extracts of chemical substances and agents
6.4 ²	Toxicity test on seeds of white mustard (<i>Sinapis alba</i>)	CZ_SOP_D06_07_353 (Ministry of Environment Bulletin, Volume <i>XVII</i> , Part 4/2007, p. 13-14; Waste Department Guidance for the determination of waste ecotoxicity, Annex 1 "Test on the seeds of white mustard (<i>Sinapis alba</i>)", STN 83 8303)	Surface, ground and waste water ⁴⁴ , extracts of waste, solutions and extracts of chemical substances and agents
6.5 ²	Determination of the inhibitory effect of water samples on the light emission of <i>Vibrio fischeri</i>	CZ_SOP_D06_07_354 (ČSN EN ISO 11348-2)	Surface, ground and waste water ⁴⁴ , extracts ⁸² , percolation water, saline, and brackish water
6.6 ²	<i>Folsomia candida</i> reproduction test – determination of the inhibition.	CZ_SOP_D06_07_355 (ČSN EN ISO 11267)	Waste, soils, sediments
6.7 ²	<i>Enchytraeus crypticus</i> reproduction test – determination of inhibition	CZ_SOP_D06_07_356 (ČSN EN ISO 16387)	Waste, soils, sediments
6.8 ²	<i>Lactuca sativa</i> – determination of inhibition of root growth	CZ_SOP_D06_07_357 (ČSN EN ISO 11269-1)	Waste, soils, sediments
6.9 ²	Determination of nitrification activity and its inhibition	CZ_SOP_D06_07_358 (ČSN ISO 15685)	Waste, soils, sediments
6.10 ²	Determination of the inhibition of the growth, germination, and germination index (phytoxicity) of Garden Cress (<i>Lepidium sativum</i>) - Acute toxicity test	CZ_SOP_D06_07_359 (F. Zucconi et al.: Biological evaluation of compost maturity. BioCycle, 22(2), 1981, pages 27–29.)	Surface, ground and waste water ⁴⁴ , extracts of waste and composts, solutions and extracts of chemical substances and agents
6.11 ²	Determination of the inhibition of the growth of Lesser Duckweed (<i>Lemna minor</i>) - Acute toxicity test	CZ_SOP_D06_07_1350 (ČSN EN ISO 20079)	Surface, ground and waste water ⁴⁴ , extracts of waste and composts, solutions and extracts of chemical substances and agents

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
7	Radiology		
7.1 ²	Determination of gross alpha activity by measuring evaporated residue in a mixture with ZnS(Ag) scintillator	ČSN 75 7611, chap. 4	Water ⁴¹ , extracts ⁸²
7.2 ²	Determination of gross alpha activity by measuring incinerated evaporated residue by means of proportional detector	ČSN 75 7611, chap. 5	Water ⁴¹ , extracts ⁸²
7.3 ²	Determination of gross beta activity by measuring evaporated residue by means of proportional detector and calculation of gross beta activity corrected for potassium 40 from measured values	CZ_SOP_D06_07_361 (ČSN 75 7612, ČSN EN ISO 9697, SÚJB Recommendation „Measurement and assessment of the content of natural radionuclides in drinking water from public sources and bottled water“, DR-RO-5.1 (Rev. 0.0), Prague 2017)	Water ⁴¹ , extracts ⁸²
7.4 ²	Determination of radium 226 after concentration by scintillation emanometry	ČSN 75 7622	Water ⁴¹ , extracts ⁸²
7.5 ²	Determination of radon 222 by scintillation emanometry after its transportation into scintillation chamber using vacuum	CZ_SOP_D06_07_363.A (ČSN 75 7624, chap. 5)	Water ⁴¹ , extracts ⁸²
7.6 ²	Determination of radon 222 by scintillation gamma-spectrometry with a well type NaI(Tl) crystal	CZ_SOP_D06_07_363.B (ČSN 75 7624, chap. 6)	Water ⁴¹ , extracts ⁸²
7.7 ²	Determination of radon 222 by liquid scintillation counting method (LSC)	CZ_SOP_D06_7_363.C (ČSN 75 7625)	Water ⁴¹
7.8 ²	Determination of uranium by spectrophotometry after separation on silica gel and calculation of ²³⁸ U from measured values	CZ_SOP_D06_07_364 (ČSN 75 7614)	Water ⁴¹ , extracts ⁸²
7.9 ²	Determination of tritium volume activity by liquid scintillation counting method (LSC)	CZ_SOP_D06_07_365 (ČSN EN ISO 9698)	Water ⁴¹ , extracts ⁸²
7.10 ²	Determination of polonium 210 after its concentration by sorption on ZnS(Ag) by the measurement of emitted scintillations	ČSN 75 7626	Water ⁴¹ , extracts ⁸²
7.11 ²	Determination of polonium 210 after total decomposition and after its concentration by sorption on ZnS(Ag) by the measurement of emitted scintillations	CZ_SOP_D06_07_366 (ČSN 75 7626)	Soils, sludge, sediments, filters
7.12 ²	Non-destructive determination of radionuclides ²⁵⁾ by high resolution gamma-spectrometry and calculation of the mass activity index I (ACI) from the measured volumetric activities of individual radionuclides	CZ_SOP_D06_07_367 (ČSN EN ISO 10703, SÚJB Recommendation "Measurement and evaluation of natural radionuclides in building materials", DR-RO-5.2 (Rev. 0.0), Prague 2017	Solid samples with granularity up to 4 mm, food, water ⁴¹ , liquid samples ⁸¹
7.13 ²	Determination of gross alpha mass activity by direct measurement of the sample by means of alpha radiation analyser	CZ_SOP_D06_07_368 (ČSN 75 7611, ISO 9696)	Solid samples ⁸⁵ pulverized for grain size below 100 µm, liquid samples ⁸⁶ with boiling point above 100 °C

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
7.14 ²	Determination of gross beta mass activity by direct measurement of the sample by means of beta radiation analyser	CZ_SOP_D06_07_369 (ČSN 75 7612, ČSN EN ISO 9697)	Solid samples ⁸⁵ pulverized for grain size below 100 µm, liquid samples ⁸⁶ with boiling point above 100 °C
7.15 ²	Determination of lead 210 after its sorption on ZnS-colloid by beta radiation analyzer	CZ_SOP_D06_07_370 (ČSN 75 7627)	Water ⁹¹ , extracts ⁹² (with low content of suspended solids or filtered through 0.45 µm filter)
7.16 ²	Determination of gross alpha activity by co-precipitation method by measurement of filtered precipitate by means of proportional detector	CZ_SOP_D06_07_371 (ČSN 75 7610)	Water ⁹¹ , extracts ⁹²
7.17 ²	Calculation of Indicative Dose (ID) ⁶⁹ from the measured values of volume activities of individual radionuclides	CZ_SOP_D06_07_372 (SÚJB Recommendation „Measurement and assessment of the content of natural radionuclides in drinking water from public sources and bottled water“, DR-RO-5.1 (Rev. 0.0), Prague 2017, Council Directive 2013/51 / EURATOM of 22. 10. 2013)	Water ⁹¹
7.18 ²	Determination of strontium 90 by proportional detector after separation	CZ_SOP_D06_07_373 (ASTM D5811-00)	Water ⁹¹
7.19 ²	Determination of strontium 90 by proportional detector after separation	CZ_SOP_D06_07_373 (ASTM D5811-00, ASTM C1507-20)	Soils, sludge, sediments
7.20 ²	Determination of strontium 90 by proportional detector after separation	CZ_SOP_D06_07_373 (ASTM D5811-00, ASTM C1507-20)	Biological materials ⁷⁷ , food, feed ⁸³
7.21 ²	Determination of carbon 14 by liquid scintillation method after separation	CZ_SOP_D06_07_374 (ČSN EN ISO 13162, ČSN EN 16640 US EPA 520/5-84-006)	Water ⁹¹ , soils, sludge, sediments, bioindicators ⁷⁶ , food
7.22 ²	Determination of total volume alpha and beta activities by liquid scintillation counting method (LSC)	CZ_SOP_D06_07_375 (ČSN EN ISO 11704, ASTM D7283-17)	Non salted water
7.23 ²	Determination of radium 226 and 228 by liquid scintillation measurement method (LSC)	CZ_SOP_D06_07_376 (ČSN EN ISO 22908)	Water ⁹¹
8	Tribology		
8.1 ¹¹	Determination of kinematic viscosity by viscometer and viscosity index by calculation	CZ_SOP_D06_05_400 (ČSN EN ISO 3104, ČSN ISO 2009, ASTM D7279, ASTM D7042)	Liquid fuels, lubricating oils
8.2 ¹¹	Determination of flash point - Pensky-Martens closed cup method by flash point analyser	CZ_SOP_D06_05_401 (ČSN EN ISO 2719, ASTM D93)	Diesel, light fuel oils

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
8.3 ¹¹	Determination of liquid cleanliness code by particle counter	CZ_SOP_D06_05_402 (User Manual for Lase Net Fines-C use and maintenance, ČSN ISO 4406)	Liquid fuels, lubricating oils
8.4 ¹¹	Determination of base number by potentiometric titration	CZ_SOP_D06_05_403 (ČSN ISO 3771)	Lubricating oils, additives to lubricants
8.5 ¹¹	Determination of neutralization number by potentiometric titration	CZ_SOP_D06_05_404 (ČSN ISO 6619)	Lubricating oils, additives to lubricants
8.6 ¹¹	Determination of water content by coulometric method	CZ_SOP_D06_05_405 (ASTM D6304)	Liquid fuels, lubricating oils
8.7 ¹¹	Determination of flash point and burning point in open cup according to Cleveland by flash point analyser	CZ_SOP_D06_05_406 (ASTM D92)	Liquid fuels, lubricating oils
8.8 ¹¹	Determination of Cold Filter Plugging Point (CFPP) by the method of gradual cooling	CZ_SOP_D06_05_407 (ČSN EN 116, ASTM D6371)	Diesel, light fuel oils
9	General Food Chemistry		
9.1 ¹	Determination of organic acids ⁶⁸ content by capillary isotachopheresis method	CZ_SOP_D06_04_450 (Recman - Laboratory technique – Application sheets No. 35, 39, 70)	Food, feed ⁸³
9.2 ¹	Gravimetric determination of fat	CZ_SOP_D06_04_451 (ČSN ISO 1443, ČSN ISO 1444, ČSN 46 7092-7)	Food, feed ⁸³
9.3 ¹	Gravimetric determination of dry matter and calculation of moisture from measured value	CZ_SOP_D06_04_452 (Journal of AOAC International vol 88, No1,2005; Journal of AOAC International vol 86, No6, 2003)	Food, feed ⁸³ , dietary supplements
9.4 ¹	Determination of nitrate and nitrite by capillary isotachopheresis	CZ_SOP_D06_04_453 (ITP: Application sheet No. 33 VILLA LABECO s.r.o.)	Food, feed ⁸³
9.5 ¹	Determination of phosphates by capillary isotachopheresis	CZ_SOP_D06_04_454 (ITP: Application sheet No. 35 VILLA LABECO s.r.o.)	Food, feed ⁸³
9.6 ¹	Gravimetric determination of water extract content	ČSN 58 0113, Article 38	Coffee
9.7 ¹	Determination of acid value and acidity by titration	CZ_SOP_D06_04_456 (ČSN EN ISO 660)	Animal and vegetable fats and oils
9.8 ¹	Determination of polyols ⁷⁵ by ion chromatographic method with EC detection	CZ_SOP_D06_04_457 (ČSN EN 15086, DIONEX Technical Note 20)	Food, feed ⁸³ , dietary supplements
9.9 ¹	Gravimetric determination of ash	CZ_SOP_D06_04_458 (ČSN 56 0116-4)	Food, feed ⁸³
9.10 ¹	Determination of crude fibre by oxidation hydrolysis method	CZ_SOP_D06_04_459 (ČSN ISO 5498, ČSN EN ISO 6865)	Feed ⁸³
9.11 ¹	Determination of pH by potentiometry	CZ_SOP_D06_04_460 (ČSN ISO 2917, ČSN ISO 1842)	Food, feed ⁸³
9.12 ¹	Determination of sand by gravimetry	CZ_SOP_D06_04_461 (ČSN 56 0246-12)	Food, feed ⁸³

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
9.13 ¹	Determination of relative density of liquids by pycnometer	CZ_SOP_D06_04_462 (ČSN EN 1131)	Low viscosity liquids
9.14 ¹	Titrimetric determination of acidity	CZ_SOP_D06_04_463 (ČSN ISO 750, ASTM 56 0116, ČSN 57 0530, ČSN EN 12147, ČSN 56 0246-13)	Fruit juices, fruit and vegetable products, mayonnaise, water-soluble food, dairy products, bakery products
9.15 ¹	Determination of moisture content – distillation method	CZ_SOP_D06_04_464 (ČSN ISO 939)	Spices, mixed condiments
9.16 ¹	Determination of dietary fibre enzymatically by commercial set Megazyme	CZ_SOP_D06_04_465 (AOAC Method 985.29)	Food, dietary supplements
9.17 ¹	Determination of starch content by polarimetry	CZ_SOP_D06_04_466 (ČSN 46 7092-21)	Cereals, baking products, cereal feeds ⁸³
9.18 ¹	Determination of chloride by coulometric titration	CZ_SOP_D06_04_467 (O.K. SERVIS company Chloride Analyser manual)	Food, feed ⁸³ , dietary supplements
9.19 ¹	Determination of reducing sugars and total sugars after iodometric inversion and calculation of non-reducing sugars from measured values	CZ_SOP_D06_04_468 (ČSN 56 0146)	Food, feed ⁸³ , dietary supplements
9.20 ¹	Determination of alkalinity of water-soluble ash by titration	ČSN ISO 1578	Tea
9.21 ¹	Gravimetric determination of total ash	ČSN ISO 1575	Tea
9.22 ¹	Gravimetric determination of water-soluble and water-insoluble ash	ČSN ISO 1576	Tea
9.23 ¹	Gravimetric determination of acid-insoluble ash	ČSN ISO 1577	Tea
9.24 ¹	Gravimetric determination of water extract	ČSN ISO 9768	Tea
9.25 ¹	Gravimetric determination of loos in mass at 103°C	ČSN ISO 1573	Tea
9.26 ¹	Determination of total nitrogen by Dumas method by analyser and protein calculation from measured values	CZ_SOP_D06_04_475 (ČSN EN ISO 14891, ČSN EN ISO 16634-1, ČSN EN ISO 16634-2)	Food, feed ⁸³ , dietary supplements
9.27 ¹	Volumetric determination of volatile oils (essential oils) by distillation with steam	ČSN EN ISO 6571	Spices, spicing agents, herbs
9.28 ¹	Determination of the weight of consumer packaging of food and animal feeding stuff products by gravimetry	CZ_SOP_D06_04_477 (ČSN 560305, ČSN 570146-3, ČSN 580170-3)	Food, feed ⁸³ , dietary supplements
9.29 ¹	Determination of the meat content in meat products and products containing meat by calculation from measured values ⁸³	CZ_SOP_D06_04_478 (Commission Directive No. 2001/101/EC, Commission Regulation No. 2004/2002/EC, Commission Regulation No. 2429/86/EEC, Decree 330/2009 Coll.)	Meat products
9.30 ¹	Determination of carbohydrates and energy values by calculation from measured values ⁶⁴	CZ_SOP_D06_04_479 (Regulation (EU) 1169/2011, Decree 330/2009 Coll.)	Food, raw materials for production of food, dietary supplements

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
9.31 ¹	Determination of non-protein content substances by calculation ⁶⁵	ČSN 46 7092-24	Feed ⁸³
9.32 ¹	Determination of 4-hydroxyproline by spectrophotometry and calculation of collagen from measured values	CZ_SOP_D06_04_481 (ISO 3496)	Meat products
9.33 ¹	Determination of fat content by NMR method	CZ_SOP_D06_04_482 (Journal of AOAC International vol 88, No. 1, 2005, Journal of AOAC International vol 86, No. 6, 2003)	Selected food ⁹⁵ and raw materials for production of food, feed ⁸³ , dietary supplements
9.34 ¹	Volumetric determination of peroxide value	CZ_SOP_D06_04_483 (ČSN EN ISO 3960)	Fats and vegetable oils
9.35 ¹	Determination of water activity by capacitive sensor method	ČSN ISO 21807	Food, raw materials for production of food, dietary supplements
9.36 ¹	Determination of net muscle protein by calculation from the content of collagen and protein	CZ_SOP_D06_04_485 (Decree No. 69/2016 Coll.)	Meat, meat products
9.37 ¹	Identification of synthetic dyes ⁸⁷ by thin-layer chromatography method	CZ_SOP_D06_04_486 (Davidek J., Laboratory Manual of Food Analysis, 1981)	Food
9.38 ¹	Determination of piperine content by spectrophotometry	ČSN ISO 5564	Black pepper and white pepper, whole or ground
9.39 ¹	Determination of starch in meat products by titration	CZ_SOP_D06_04_488 (BS 4401 Part 12:1979 Determination of Starch Content of Meat Products)	Meat products
9.40 ¹	Determination of total sulphur dioxide after distillation by titration	CZ_SOP_D06_04_489 (Prof. Ing. J. Davidek, DrSc. et al.: Laboratory Manual of Food Analysis, SNTL 1981)	Food and raw materials for food production, dietary supplements
9.41 ¹	Determination of total sulphur dioxide after distillation by ITP	CZ_SOP_D06_04_489 (Prof. Ing. J. Davidek, DrSc. et al.: Laboratory Manual of Food Analysis, SNTL 1981, Application sheet No. 33 Villa Labeco)	Food and raw materials for food production, dietary supplements
9.42 ¹⁰	Sensory testing – description test	CZ_SOP_D06_04_490 (ČSN ISO 6658, ČSN EN ISO 8589, ČSN EN ISO 13299, ČSN ISO 13300-1,2)	Food, cosmetics, packaging materials for food, consumer goods
9.43 ¹⁰	Sensory testing – comparison to standard	CZ_SOP_D06_04_491 (ČSN ISO 6658, ČSN ISO EN 8589, ČSN EN ISO 13299, ČSN ISO 13300-1,2)	Food, cosmetics, packaging materials for food, consumer goods
9.44 ¹⁰	Assessment of characteristics of food	CZ_SOP_D06_04_492 (ČSN EN ISO 8589, ČSN EN ISO 13299, ČSN ISO 13300-1,2)	Food
9.45 ¹	Determination of density by density meter	CZ_SOP_D06_04_493 (ČSN 57 0530)	Milk and milk products

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Ordinal number ¹	Test procedure/method name	Test procedure/method identification ²	Subject of the test
9.46 ¹	Determination of sugars ⁶⁰ by ion chromatography method with EC detection	CZ_SOP_D06_04_494 (ČSN EN 12630)	Food, feed ⁴³ , dietary supplements
9.47 ¹	Determination of ethanol after distillation by gravimetry	CZ_SOP_D06_04_495 (ČSN 56 0186-5, ČSN 56 0210, ČSN 56 0216)	Alcoholic beverages

Annex:

Flexible scope of accreditation

Ordinal numbers of tests
1.1 - 1.12; 1.15 - 1.18; 1.41; 1.44; 1.48; 1.51; 1.67 - 1.68; 1.70; 1.84; 1.91; 1.113 - 1.116; 1.128; 1.131 - 1.132; 1.138; 1.140; 1.146; 1.151 - 1.152; 1.157; 1.159; 1.163 - 1.165; 1.178; 1.181
2.1 -2.14; 2.16 - 2.34; 2.38 - 2.41; 2.43 - 2.46; 2.51 - 2.55; 2.57 - 2.86; 2.88 - 2.91
3.1–3.22; 3.24 - 3.36
6.1–6.11
7.3; 7.12; 7.17
9.1; 9.8, 9.37; 9.46

The Laboratory is allowed to modify the test methods listed in the Annex within the specified scope of accreditation provided the measuring principle is observed. The flexible approach to the scope of accreditation cannot be applied to the tests not included in the Annex.

Sampling:

Ordinal number ¹	Sampling procedure name	Sampling procedure identification ²	Subject of sampling
1 ^{1,2,4,5,6,7,8,9}	Sampling of grab sample of surface water manually	CZ_SOP_D06_01_V01 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN ISO 5667-4, ČSN EN ISO 5667-6, ČSN EN ISO 5667-14)	Surface water
2 ^{1,2,3,4,5,6,7,8,9}	Sampling of grab sample of waste water manually	CZ_SOP_D06_01_V02 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN ISO 5667-10, ČSN EN ISO 5667-14,)	Waste water ⁴⁴
3 ^{1,2,3,4,5,6,7,8,9,12}	Sampling of drinking water and hot drinking water manually	CZ_SOP_D06_01_V03 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN ISO 5667-5, ČSN EN ISO 5667-14, ČSN EN ISO 5667-21, ČSN EN ISO 19458, Decree 252/2004 Coll., Decree of SÚJB No. 307/2002 Coll.)	Drinking water, hot water

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Ordinal number ¹	Sampling procedure name	Sampling procedure identification ²	Subject of sampling
4 ^{1,2,3,4,5,6,7,8,9}	Sampling of mixed sample of waste water manually and using an automatic sampler	CZ_SOP_D06_01_V04 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN ISO 5667-10, ČSN EN ISO 5667-14)	Waste water ⁴⁴
5 ^{1,2,3,4,5,7,8,9}	Sampling of treated water manually	CZ_SOP_D06_01_V05 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN ISO 5667-5, ČSN ISO 5667-7, ČSN EN ISO 5667-14)	Treated water ⁵⁰
6 ^{1,2,3,4,5,6,7,8,9}	Sampling of water from artificial bathing site manually	CZ_SOP_D06_01_V06 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN ISO 5667-4, ČSN ISO 5667-5, ČSN EN ISO 5667-6, ČSN EN ISO 5667-14, ČSN EN ISO 19458, ČSN EN 15288-2, Decree No. 238/2011 Coll.)	Pool water and filling water of artificial bathing sites
7 ^{1,2,3,4,5,6,7,8,9}	Sampling of grab sample of ground water manually and using pumps	CZ_SOP_D06_01_V07 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN ISO 5667-11, ČSN EN ISO 5667-14)	Ground water from boreholes and wells
8 ^{1,2,4,5,6,7,8,9}	Sampling of surface swab manually	CZ_SOP_D06_01_V08 (ČSN 56 0100:1994, ČSN EN ISO18593, Decree No. 289/2007 Coll., ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN EN ISO 5667-14)	Contaminated surfaces
9 ^{1,2,4,5,6,7,8,9}	Sampling of sludge from sewage and treatment plants manually	CZ_SOP_D06_01_V09 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN EN ISO 5667-13, ČSN EN ISO 5667-14, ČSN EN ISO 5667-15, ČSN EN ISO 19458)	Sludge from water treatment plants, sludge dumps
10 ^{1,2,3,4,5,6,7,8,9}	Sampling of bottom sediments manually	CZ_SOP_D06_01_V10 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN ISO 5667-12, ČSN EN ISO 5667-14, ČSN EN ISO 5667-15, ČSN ISO 5667-17)	Bottom sediments from streams and reservoirs
11 ^{1,2,3,4,5,6,7,8,9}	Sampling of soils manually	CZ_SOP_D06_01_V11 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN EN ISO 5667-13, ČSN EN ISO 5667-14,	Soils

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Ordinal number ¹	Sampling procedure name	Sampling procedure identification ²	Subject of sampling
		ČSN EN ISO 5667-15, TNI CEN/TR 15310-1, TNI CEN/TR 15310-2, TNI CEN/TR 15310-3, TNI CEN/TR 15310-4, TNI CEN/TR 15310-5, ČSN 015110, ČSN 015111, ČSN EN 14899, ČSN EN ISO 19458)	
12 ^{1,2,3,4,5,6,7,8,9}	Sampling of waste manually	CZ_SOP_D06_01_V12 (ČSN EN ISO 5667-1, ČSN EN ISO 5667-3, ČSN EN ISO 5667-13, ČSN EN ISO 5667-14, ČSN EN ISO 5667-15, TNI CEN/TR 15310-1, TNI CEN/TR 15310-2, TNI CEN/TR 15310-3, TNI CEN/TR 15310-4, TNI CEN/TR 15310-5, ČSN 015110, ČSN 015111, ČSN 015112, ČSN EN 14899, ČSN EN ISO 19458, ČSN EN ISO 3170, Methodological Guide of ME for Waste Sampling 2008, 101s)	Waste
13 ^{1,2,4,5,6,7}	Air sampling by personal pump	CZ_SOP_D06_01_V13 (ČSN EN 481, ČSN EN 482, ČSN EN 689+AC, GR No. 361/2007 Coll.)	Working environment ⁸⁷
14	Reserved		
15 ^{1,2,7}	Gas sampling for the determination of ammonia	CZ_SOP_D06_01_V15 (ČSN 834728)	Gases ⁸⁶
16 ¹	Stationary air sampling for the determination of the number of asbestos and mineral fibers	CZ_SOP_D06_01_V16 (ISO 14966, chap. 5; VDI 3492, chap. 5 and 6, ČSN EN ISO 16000-7; ČSN EN 482, GR No. 361/2007, Coll. Annex No. 3)	Outdoor and indoor air, working environment ⁸⁷
17 ¹	Sampling for the asbestos determination	CZ_SOP_D06_01_V17 (VDI 3866, part 1)	Building materials ⁸² , materials for building ⁸⁹ ,

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Used abbreviations

AHEM	Acta hygienica, epidemiologica et microbiologica
AITM	Airbus methods
BDE	Brominated diethylethers
BFR	Brominated flame retardants
ACI	Activity Concentration Index
CFA	Continuous Flow Analyser
CFPP	Cold Filter Plugging Point
ČL	Czech Pharmacopoeia
DIN	Deutscher Institut fuer Normung
DM 06/09/94 GU n° 288 10/12/1994 Alii. I Met. B.	Decree of 06/09/1994 (Decreto Ministeriale 6 settembre 1994), published in Bulletin No. 288 10/12/1994
EC	Electrochemical detection
ECD	Electron Capture Detector
FID	Flame Ionization Detector
FLD	Fluorescence Detector
GR	Government Regulation
HRGC/HRMS	High Resolution Gas Chromatography/High Resolution Mass Spectrometry
I	Mass activity index
ID	Indicative dose
IP	International Petroleum test method
IR	Infrared Region Detector
ISE	Ion Selective Electrode
ISO	International Organization for Standardisation
ITP	Isotachopheresis
LDN	Labor Diagnostika Nord GmbH & Co.KG
LSC	Liquid Scintillation Counting method for the determination of alpha- or beta- radiation emittingradionuclides
MS	Mass Detector
MUFA	Monounsaturated Fatty Acids
NEN	Nederlands Normalisatie-Instituut
NIOSH	National Institute for Occupation Safety and Health
NIOSH ¹⁾	Methods used for CZ_SOP_D06_03 153 - NIOSH 1400, NIOSH 1450, NIOSH 1457, NIOSH 1500, NIOSH 1501, NIOSH 1003, NIOSH 1005, NIOSH 1007, NIOSH 1022, NIOSH 1602, NIOSH 1609
PBB	Polybrominated biphenyls
PhEur	European Pharmacopoeia
PDA	Photo-Diode-Array detector
PUFA	Polymunsaturated Fatty Acids
RI	Refractometric Detector
SAFA	Saturated Fatty Acids
SEM/EDS	Scanning Electron Microscope / Energy Dispersive Spectrometer
SFS	The Finish Standard Association

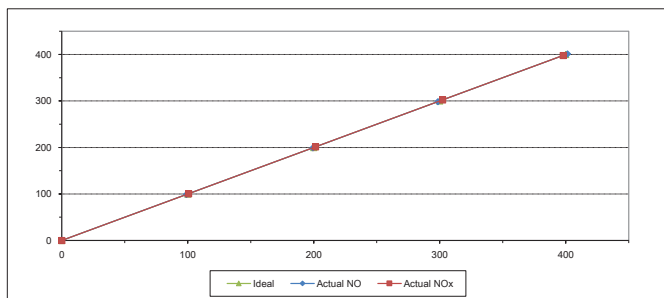
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MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	148EH0E0	Equipment ID	BKK_FS1084
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00	100.70	0.70	0.70
2	200.00	199.40	-0.60	-0.30	201.50	1.50	0.75
3	300.00	298.60	-1.40	-0.47	302.30	2.30	0.77
4	400.00	401.40	1.40	0.35	398.00	-2.00	-0.50
AVERAGE (%)				-0.26			0.36



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

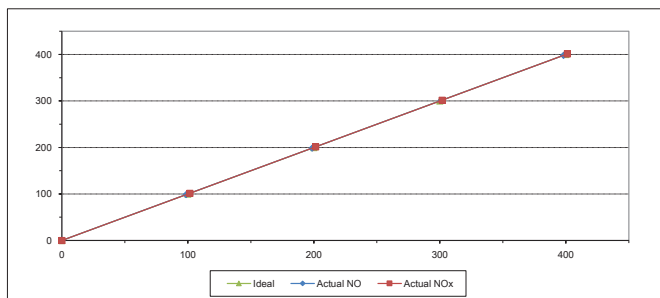
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	ALP0V0WY	Equipment ID	RYG_FS0455
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.60	-1.40	-1.40	101.60	1.60	1.60
2	200.00	198.70	-1.30	-0.65	201.40	1.40	0.70
3	300.00	301.00	1.00	0.33	301.80	1.80	0.60
4	400.00	398.20	-1.80	-0.45	401.20	1.20	0.30
AVERAGE (%)				-0.41			0.66



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

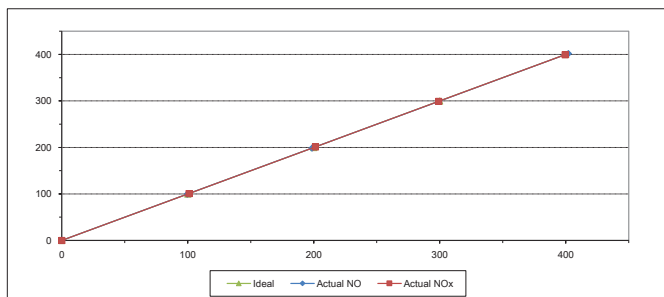
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FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	H73KYD1M	Equipment ID	BKK_FS0797
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30	101.00	1.00	1.00
2	200.00	198.60	-1.40	-0.70	201.30	1.30	0.65
3	300.00	299.00	-1.00	-0.33	299.20	-0.80	-0.27
4	400.00	402.10	2.10	0.53	399.50	-0.50	-0.13
AVERAGE (%)				-0.14			0.27



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

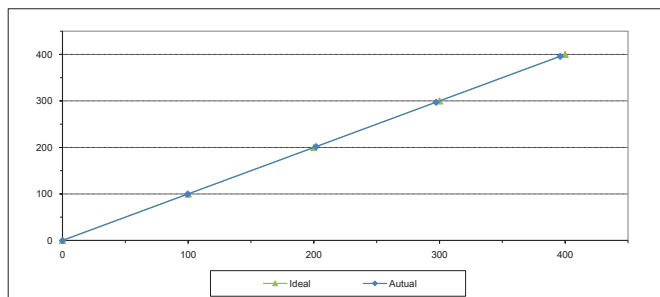
ALS Laboratory Group
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	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

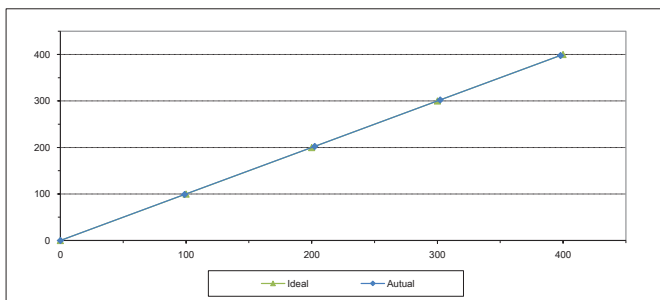
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FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	NM3M2D5M	Equipment ID	RYG_FS0286
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	58.3	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	202.40	2.40	1.20
3	300.00	302.30	2.30	0.77
4	400.00	398.00	-2.00	-0.50
AVERAGE (%)				0.09



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

ALS Laboratory Group

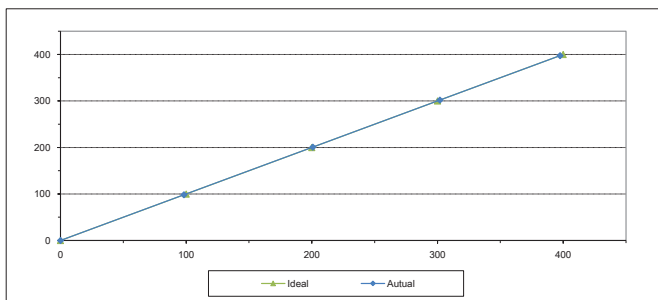
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	H0S3D9FA	Equipment ID	RYG_FS0454
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	58.3	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	98.30	-1.70	-1.70
2	200.00	200.80	0.80	0.40
3	300.00	301.90	1.90	0.63
4	400.00	397.50	-2.50	-0.63
AVERAGE (%)				-0.24



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

ALS Laboratory Group

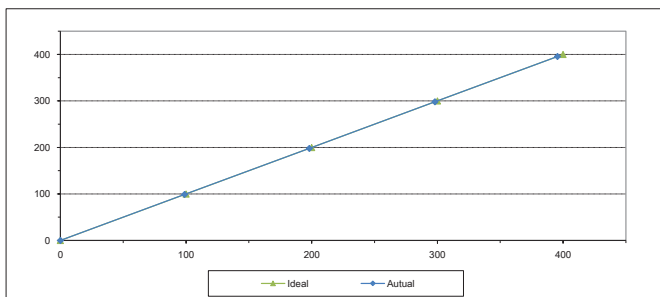
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date	1-Jul-22	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	G2CH436B	Equipment ID	BKX_FS0796
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	58.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	98.91	-1.09	-1.09
2	200.00	198.10	-1.90	-0.95
3	300.00	298.10	-1.90	-0.63
4	400.00	395.60	-4.40	-1.10
AVERAGE (%)				-0.74



Calibrated By

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

Approved By

(Mr. Sarayuth Jitranont)
Assistant General Manager

ALS Laboratory Group

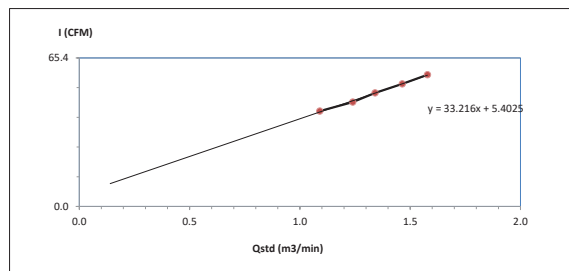
FORM NO.: F 06-056 REVISION NO.: - ISSUE DATE: 02/04/12



High Volume Air Sampler Calibration Worksheet

Project Site :	UACJ (Thailand) Co., Ltd.	Barometric Pressure (mm Hg) :	755
Calibrate Location :	บ้านท่าเสา (Ban Phusai)	Temperature (°C) :	29
Calibrate Date :	1-Aug-22	High Volume ID :	RYG_FS0175
Calibration Sheet No. :	C-010822-RYG_FS0175	High Volume Model :	TE-5170D
Calibrator ID :	RYG_FS0205	High Volume S/N :	4801
Calibrator Model :	TE-5028A	Calibrator Slope :	1.53016
Calibrator S/N :	1166	Calibrator Intercept :	-0.0468

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.6	1.0901	42	Slope : 33.2160 Intercept : 5.4025 Correlation Coefficient : 0.9983
2	3.4	1.2399	46	
3	4.0	1.3409	50	
4	4.8	1.4644	54	
5	5.6	1.5780	58	



Calibrated by

(Mr. Nontachai Uppathamp)
Field Scientist(1)

Approved by :

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

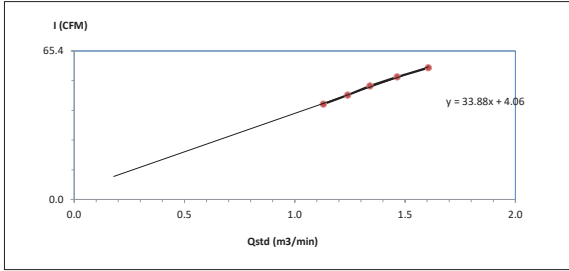
FORM NO.: F 06-073 REVISION NO.: - ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : UACJ (Thailand) Co., Ltd. Barometric Pressure (mm Hg) : 755
Calibrate Location : บ้านหวายไคหนอย (Ban Huay Kai Nhow) Temperature (°C) : 29
Calibrate Date : 1-Aug-22 High Volume ID : RYG_FS0292
CalibrationSheet No.: C-010822-RYG_FS0292 High Volume Model : TE-5170D
Calibrator ID: RYG_FS0205 High Volume S/N : 5497
Calibrator Model : TE-5028A Calibrator Slope : 1.53016
Calibrator S/N : 1166 Calibrator Intercept : -0.0468

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.8	1.1295	42	Slope : 33.8803 Intercept : 4.0600 Correlation Coefficient : 0.9979
2	3.4	1.2399	46	
3	4.0	1.3409	50	
4	4.8	1.4644	54	
5	5.8	1.6051	58	



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

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

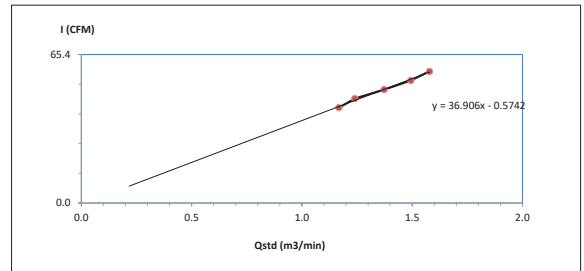
FORM NO: F 06-073 REVISION NO.: - ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : UACJ (Thailand) Co., Ltd. Barometric Pressure (mm Hg) : 755
Calibrate Location : บ้านวังตาด (Ban Wang Tan Mhon) Temperature (°C) : 29
Calibrate Date : 1-Aug-22 High Volume ID : RYG_FS0393
CalibrationSheet No.: C-010822-RYG_FS0393 High Volume Model : TE-5170D
Calibrator ID: RYG_FS0205 High Volume S/N : 5682
Calibrator Model : TE-5028A Calibrator Slope : 1.53016
Calibrator S/N : 1166 Calibrator Intercept : -0.0468

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.0	1.1675	42	Slope : 36.9056 Intercept : -0.5742 Correlation Coefficient : 0.9958
2	3.4	1.2399	46	
3	4.2	1.3728	50	
4	5.0	1.4936	54	
5	5.6	1.5780	58	



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

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

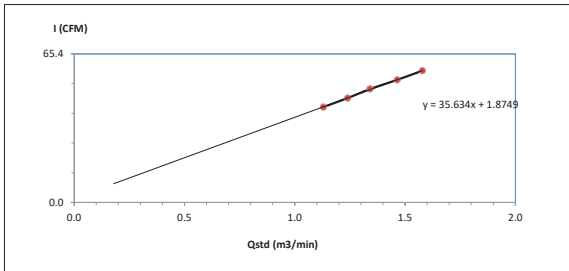
FORM NO: F 06-073 REVISION NO.: - ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : UACJ (Thailand) Co., Ltd. Barometric Pressure (mm Hg) : 755
Calibrate Location : บ้านแม่งาย (Ban Map Yang Porn) Temperature (°C) : 29
Calibrate Date : 1-Aug-22 High Volume ID : RYG_FS0291
CalibrationSheet No.: C-010822-RYG_FS0291 High Volume Model : TE-5170D
Calibrator ID: RYG_FS0205 High Volume S/N : 5333
Calibrator Model : TE-5028A Calibrator Slope : 1.53016
Calibrator S/N : 1166 Calibrator Intercept : -0.0468

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.8	1.1295	42	Slope : 35.6343 Intercept : 1.8749 Correlation Coefficient : 0.9995
2	3.4	1.2399	46	
3	4.0	1.3409	50	
4	4.8	1.4644	54	
5	5.6	1.5780	58	



Calibrated by : Mr. Nontachai Uppathamp
(Mr. Nontachai 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



PENTA
CALIBRATION

RYG_EN0001
PENTA CALIBRATION CO., LTD.
66/124 The Connect 33 Village Kanchanaphisek Road
Dokmai Prawet Bangkok 10250
Tel: +66 (0) 2069-9773
www.pentalab.com

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/m³

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. Rungroje Metakul



REVIEW BY : Tharbell
APPROVED BY : P. Juntarupan
NEXT CAL. DATE : 03/03/29



Mr. Kriangsak Kallani
(Mr. Kriangsak Kallani)
Reviewed by

Approved By : Mr. Keattisak Kerdto
(Mr. Keattisak Kerdto)
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 recognised 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.
This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co., ltd

Represent to Certificate of Calibration ,PTC/07/22102

Certificate No.: PTC/07/22102

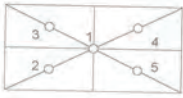
Page: 2 of 2

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 $1/2 \leq L_1 \leq$ Maximum capacity

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

Nominal test value (g)	Standard Deviation
100	0.00009

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)

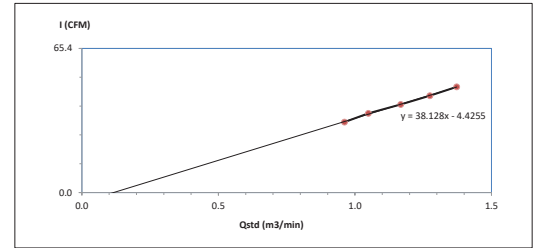
The End of Certificate

PTC/NC-07-02: 2 Feb 2020

High Volume Air Sampler Calibration Worksheet

Project Site :	UACJ (Thailand) Co., Ltd.	Barometric Pressure (mm Hg) :	755
Calibrate Location :	บ้านทุ่งโพธิ์ (Ban Thung Phosai)	Temperature (°C) :	29
Calibrate Date :	1-Aug-22	High Volume ID :	RYG FS0183
CalibrationSheet No.:	C-010822-RYG FS0183	High Volume Model :	TE-5009X
Calibrator ID:	RYG FS0205	High Volume S/N :	4791
Calibrator Model :	TE-5028A	Calibrator Slope :	1.53016
Calibrator S/N :	1166	Calibrator Intercept :	-0.0468

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.9619	32	Slope : 38.1278 Intercept : -4.4255 Correlation Coefficient : 0.9991
2	2.4	1.0492	36	
3	3.0	1.1675	40	
4	3.6	1.2745	44	
5	4.2	1.3728	48	



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

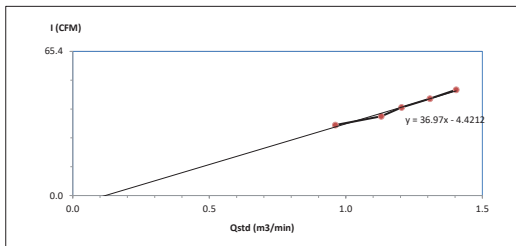
Approved by Mr. Noppong Juntarupan
Enviro Field Coordinator Scientist (3)

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

High Volume Air Sampler Calibration Worksheet

Project Site :	UACJ (Thailand) Co., Ltd.	Barometric Pressure (mm Hg) :	755
Calibrate Location :	บ้านห้วยไคร้ (Ban Huay Kai Nhow)	Temperature (°C) :	29
Calibrate Date :	1-Aug-22	High Volume ID :	RYG FS0400
CalibrationSheet No.:	C-010822-RYG FS0400	High Volume Model :	TE-5009X
Calibrator ID:	RYG FS0205	High Volume S/N :	5691
Calibrator Model :	TE-5028A	Calibrator Slope :	1.53016
Calibrator S/N :	1166	Calibrator Intercept :	-0.0468

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.9619	32	Slope : 36.9697 Intercept : -4.4212 Correlation Coefficient : 0.9912
2	2.8	1.1295	36	
3	3.2	1.2043	40	
4	3.8	1.3081	44	
5	4.4	1.4040	48	



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

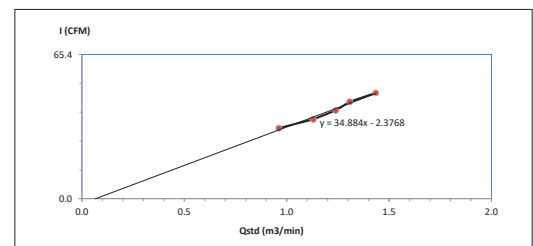
Approved by Mr. Noppong Juntarupan
Enviro Field Coordinator Scientist (3)

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

High Volume Air Sampler Calibration Worksheet

Project Site :	UACJ (Thailand) Co., Ltd.	Barometric Pressure (mm Hg) :	755
Calibrate Location :	บ้านวังต๋านหมื่น (Ban Wang Tan Mhon)	Temperature (°C) :	29
Calibrate Date :	1-Aug-22	High Volume ID :	RYG FS0398
CalibrationSheet No.:	C-010822-RYG FS0398	High Volume Model :	TE-5009X
Calibrator ID:	RYG FS0205	High Volume S/N :	5684
Calibrator Model :	TE-5028A	Calibrator Slope :	1.53016
Calibrator S/N :	1166	Calibrator Intercept :	-0.0468

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.9619	32	Slope : 34.8843 Intercept : -2.3768 Correlation Coefficient : 0.9901
2	2.8	1.1295	36	
3	3.4	1.2399	40	
4	3.8	1.3081	44	
5	4.6	1.4345	48	



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

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

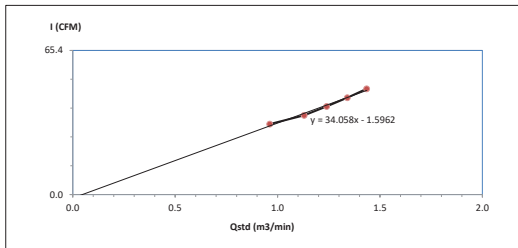
FORM NO.: F 06-074 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : UACJ (Thailand) Co., Ltd. Barometric Pressure (mm Hg) : 755
 Calibrate Location : บ้านบางยม (Ban Map Yang Porn) Temperature (°C) : 29
 Calibrate Date : 1-Aug-22 High Volume ID : RYG-FS0399
 Calibration Sheet No. : C-010822-RYG-FS0399 High Volume Model : TE-5009X
 Calibrator ID : RYG-FS0205 High Volume S/N : 5683
 Calibrator Model : TE-5028A Calibrator Slope : 1.53016
 Calibrator S/N : 1166 Calibrator Intercept : -0.0468

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.0	0.9619	32	Slope : 34.0580 Intercept : -1.5962 Correlation Coefficient : 0.9924
2	2.8	1.1295	36	
3	3.4	1.2399	40	
4	4.0	1.3409	44	
5	4.6	1.4345	48	



Calibrated by N. Nontachai Uppathamp (Mr. Nontachai Uppathamp) Field Scientist(1)
 Approved by Mr. Noppong Juntaruporn (Mr. Noppong Juntaruporn) Enviro Field Coordinator Scientist (3)

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



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

CERTIFICATE OF CALIBRATION

Certificate No: WS-01102021
 Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.
 Manufacturer : Data logger: Novatyns.
 Model/Type : Data logger: 200-WS-25DL.
 Serial Number : Data logger: A4985.
 ID No : Data logger: RYG-FS0085.
 Customer : ALS laboratory group (Thailand) co., Ltd.
 Test Conditions : Wind tunnel cross test section area: 900 cm².
 Test Conditions : Anemometer frontal area: 100 cm².
 Test Conditions : Diameter of mounting pipe: 1 mm.
 Test Conditions : Blockage ratio of test object: 0.111 [%].
 Test Conditions : Air temperature: 24.0 ±0.6 °C.
 Test Conditions : Air pressure: 1008.1 ±0.4 hPa.
 Test Conditions : Relative air humidity: 58.1 ±3.5 %RH.
 Calibration Procedure : Calibration was carried out based on:
 Calibration Procedure : ISO 61400-12-1 601: 2005-Performance Measurements of Electricity Producing Wind Turbines.
 Calibration Procedure : MSA/NET Anemometer Calibration Procedure - Version 2: 2009.
 Traceability : This calibration documents the traceability to national standard, which realize the unit of measurement according to the international system of units (SI) through National Institute of Metrology Thailand (NIMT).
 Measurement Date : Oct 06, 2021.
 Issued Date : Oct 11, 2021.

REVIEW BY Nontachai U.
 APPROVED BY Mr. Noppong J.
 NEXT CAL DATE: 8/4/23

Calibrated by ☒ Mr. Sornwit Thachad ☐ Miss Orathai Wivattakulay
 Approved Signatory: Mr. Parinya Booncharoen
 Technical Support and Calibration Manager



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



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

Certificate No: WS-01102021
 Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment
 Calibration in the range of 1 - 16 m/s at a calibration interval of 1 m/s.
 The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} Reading m/s	V _{unc} Reading m/s	Error (m/s)	Uncertainty (%)
2.049	1.9	-0.1	2.7
4.103	4.0	-0.1	1.3
6.01	6.0	0.0	1.1
8.01	8.0	0.0	0.99
9.99	10.0	0.0	1.0
11.99	12.1	0.1	0.64
13.98	14.1	0.1	0.65
16.02	16.2	0.2	0.40
18.03	18.2	0.2	0.78
19.99	19.1	-0.1	0.61
11.00	11.0	0.0	1.1
9.00	9.0	0.0	0.75
7.02	7.0	0.0	0.84
5.147	5.0	-0.1	0.98
2.974	2.9	-0.1	1.7
1.013	0.9	-0.1	4.5

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: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Fluid static	TESTO INC.	0332145	Aug 07, 2021	MR-0034-21	5 - 30 m/s
2	Pressure Differential, Pressure Meter	Ziglab	DM2500	Aug 07, 2021	MR-0034-21	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8455-12	Aug 28, 2021	MR-0034-21	0 - 5 m/s
4	Temperature	Ziglab	DSH-T1P	March 30, 2021	CR-027-24	-32 - 70°C
5	Relative humidity	Ziglab	DSH-T1P	March 30, 2021	RR-00332021	0 - 100 %RH
6	Atmospheric pressure	Ziglab	DSH-T1P	March 30, 2021	RR-01032021	500 - 1100 hPa
7	Wind tunnel	CSM	MP3300			0 - 50 m/s

End of certificate of calibration



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

CERTIFICATE OF CALIBRATION

Certificate No: WS-01102021
 Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.
 Manufacturer : Data logger: Novatyns.
 Model/Type : Data logger: 200-WS-25DL.
 Serial Number : Data logger: A4985.
 ID No : Data logger: RYG-FS0085.
 Customer : ALS laboratory group (Thailand) Co., Ltd.
 Environmental Condition : The measurement was carried out in an ambient temperature of (23±3) °C, and relative humidity of (40±10) %.
 Measurement Method : The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and line laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.
 Note: The UUC was warmed up for 1 hour prior to the calibration being performed.
 Traceability : The measurement results are traceable to the international system of units (SI) through Certificate No: CS553-07-0045.
 Measurement Date : Oct 06, 2021.
 Issued Date : Oct 11, 2021.

Performed by ☒ Mr. Sornwit Thachad ☐ Miss Orathai Wivattakulay



Approved Signatory: Mr. Parinya Booncharoen
 Technical Support and Calibration Manager

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

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	42	-3	3.0
3		90	90	88	-2	3.0
4		135	135	135	0	3.0
5		180	180	182	2	3.0
6		225	225	228	3	3.0
7		270	270	273	3	3.0
8		315	315	318	3	3.0
9	Counter Clockwise	0/360	360	359	-1	3.0
10		45	45	42	-3	3.0
11		90	90	88	-2	3.0
12		135	135	135	0	3.0
13		180	180	182	2	3.0
14		225	225	228	3	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



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. Petchurai
(Thanakul Petchurai)



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

QF-TS12-04-04-020664

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-42KAI	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

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

Cert. No. : ACL21117
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233183 / 144835 / 23230
ID No.: RYG_FS0024

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
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 : 21 SEPTEMBER 2021
Calibration Date : 04-06 OCTOBER 2021
Date of Issue : 11 OCTOBER 2021



Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Cert. No. : ACL21117
Job No. : VC64AC0070
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	8846A	1997025	EEL.BP. 06/0264	05-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAJ	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

T. Petchurai

Cert. No. : ACL21117
Job No. : VC64AC0070
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	✓	-	0.4	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. Petchurai

Cert. No. : ACL21117
Job No. : VC64AC0070
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)
22.9

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

Frequency Weighting	Measured value (dB)
A-weight	13.8
C-weight	19.7
Flat	25.4

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	-0.1	-0.1	-0.1	± 1.5
1000	0.0	-0.1	0.0	± 1.0
8000	0.3	0.4	0.4	± 5.0

QF-TS12-04-04-020664

T. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACL21117
Job No. : VC64AC0070
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21117
Job No. : VC64AC0070
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.2	0.2	± 1.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21117
Job No. : VC64AC0070
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
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

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

Continuation of Calibration Certificate

Cert. No. : ACL21117
Job No. : VC64AC0070
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

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. : ACL22054
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00233184 / 144837 / 23232
ID No.: RYG_FS0025

Condition As Found : GOOD

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

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

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

REVIEW BY: *Nathakorn P.*
APPROVED BY: *T. Petchur*
NEXT CAL DATE: 21/1/23

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. : ACL22054
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	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	1500-07774E	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).

QF-TS12-04-04-020664

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22054
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	✓	-	0.4	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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22054
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)
14.2

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

Frequency Weighting	Measured value (dB)
A-weight	10.8
C-weight	17.0
Flat	22.8

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	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.9	-0.8	-0.8	±5.0

QF-TS12-04-04-020664

T. Petchur

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL22054
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	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

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T. P. A.

Continuation of Calibration Certificate

Cert. No. : ACL22054
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	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

QF-TS12-04-04-020664

T. P. A.

Continuation of Calibration Certificate

Cert. No. : ACL22054
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	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

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

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

QF-TS12-04-04-020664

T. P. A.

Continuation of Calibration Certificate

Cert. No. : ACL22054
Job No. : VC65AC0043
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. P. A.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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Cert. 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 FS0026

Condition As Found : GOOD

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

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

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



Calibrated by : Nathakorn Pisutpaisan

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

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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	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	1500-07774E	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).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.6	-1.5	-1.5	± 5.0

QF-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
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

T. P. K.

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

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T. P. K.

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, Lcpeak (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

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T. P. K.

Continuation of Calibration Certificate

Cert. No. : ACL22059
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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

QF-TS12-04-04-020664

T. P. K.

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. : ACL22057
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00296517 / 179120 / 87527
ID No.: RYG_FS0434

Condition As Found : GOOD

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

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

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



Calibrated by : Nathakorn Pisutpaisan

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

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22057
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	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	1500-07774E	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

T. Petchurai

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22057
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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22057
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)
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	11.6
C - weight	17.7
Flat	23.4

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	0.1	0.1	0.1	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.6	0.7	0.7	± 5.0

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T. Petchurai

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T. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACL22057
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	-0.1	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.0	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

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T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL22057
Job No. : VC65AC0043
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	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	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

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T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL22057
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	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 _{peak} (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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T. R. R.

Continuation of Calibration Certificate

Cert. No. : ACL22057
Job No. : VC65AC0043
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. R. R.

Cert. No. : ACL22058
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00296518 / 179118 / 87525
ID No.: RYG_FS0431

Condition As Found : GOOD

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

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

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



Calibrated by : Natiakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Cert. No. : ACL22058
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	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	1500-07774E	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).

QF-TS12-04-04-020664

*T. Petchurai*Cert. No. : ACL22058
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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*T. Petchurai*Cert. No. : ACL22058
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	17.6
Flat	23.2

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.1	0.1	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.8	0.9	0.9	± 5.0

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T. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACL22058
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	-0.1	-0.1	0.0	±2.0
125	0.0	0.0	-0.1	±1.5
250	-0.1	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±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

T.P.T.

Continuation of Calibration Certificate

Cert. No. : ACL22058
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	136.1	0.1	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 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	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

QF-TS12-04-04-020664

T.P.T.

Continuation of Calibration Certificate

Cert. No. : ACL22058
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	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
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.P.T.

Continuation of Calibration Certificate

Cert. No. : ACL22058
Job No. : VC65AC0043
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	89.7	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

T.P.T.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthon 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. : ACC21010
Pages : 1 of 3

Calibration Certificate

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

Condition As Found : GOOD

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

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

Received Date : 05 AUGUST 2021
Calibration Date : 09 AUGUST 2021
Date of Issue : 11 AUGUST 2021

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC21010
Job No. : VC64AC0058
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-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	8846A	1997025	EEL.BP. 06/0264	05-Feb-22
Digital Multimeter	33461A	MY53220116	EEL.BP. 04/0264	10-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-21	10-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

T. Petchur

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC21010
Job No. : VC64AC0058
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	94.16	0.16	0.23	0.40

2. Frequency

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

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.38	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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthon 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. : 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 Petchurai)

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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-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).

QF-TS12-04-04-020664

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

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)	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

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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)	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

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

10. Peak C sound level

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

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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	0.0	± 1.5
89.6	89.6		

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

451-451/1 Sirinthon Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comNSC-TIS-17025
CALIBRATION 0394Cert. No. : ACL22159
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472130 / 157774 / 72464
ID No.: RYG FS0303

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

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchuraj
(Thanakul Petchuraj)

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Continuation of Calibration Certificate

Cert. No. : ACL22159
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-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

Continuation of Calibration Certificate

Cert. No. : ACL22159
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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22159
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)
23.4

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

Frequency Weighting	Measured value (dB)
A - weight	15.4
C - weight	21.0
Flat	26.9

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	0.0	0.0	0.0	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-0.3	-0.2	-0.2	±5.0

Continuation of Calibration Certificate

Cert. No. : ACL22159
Job No. : VC65AC0069
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	-0.2	-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	0.0	0.0	±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	93.9	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	93.9	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	93.9	94.0	0.1	± 0.3

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Continuation of Calibration Certificate

Cert. No. : ACL22159
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	137.1	0.1	± 1.1
136.0	136.1	0.1	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 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	129.1	0.1	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.1	0.1	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.1	0.1	± 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	26.9	-0.1	± 1.1
26.0	26.0	0.0	± 1.1
25.0	25.0	0.0	± 1.1

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL22159
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	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

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

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

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL22159
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		
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

T. Petchur

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. : 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 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

REVIEW BY: *Nathakorn P.*
APPROVED BY: *T. Petchur*
NEXT CAL DATE: 11/9/23

Calibrated by : Nathakorn Pisutpaisan

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

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

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).

QF-TS12-04-04-020664

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

QF-TS12-04-04-020664

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

QF-TS12-04-04-020664

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

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		
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

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



Cert. No. : ACL21078
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00597167 / 157778 / 34375
ID No.: RYG_FS0437

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 AUGUST 2021
Calibration Date : 06 - 10 AUGUST 2021
Date of Issue : 11 AUGUST 2021

REVIEW BY : *Nathakorn P.*
APPROVED BY : *[Signature]*
NEXT CAL. DATE : 6/8/22

Calibrated by : Nathakorn Pisutpaisan

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

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QF-TS12-04-04-020664

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VC64AC0058
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	8846A	1997025	EEL-BP, 06/0264	05-Feb-22
Digital Multimeter	33461A	MY53220116	EEL-BP, 04/0264	10-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	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

P.T.N.

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VC64AC0058
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

P.T.N.

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VC64AC0058
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)
16.5

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	18.6
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	0.5	0.6	0.6	± 1.5
1000	-0.1	-0.1	0.0	± 1.0
8000	-1.6	-1.6	-1.6	±5.0

QF-TS12-04-04-020664

P.T.N.

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VC64AC0058
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

QF-TS12-04-04-020664

P.T.N.

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VC64AC0058
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	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	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VC64AC0058
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 _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	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. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VC64AC0058
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

T. Petchur

451-451/1 Sirdinthorn Rd., Bangbunmu, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL21079
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00597168 / 180412 / 88182
ID No. : RYG_FS0438

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 AUGUST 2021
Calibration Date : 06-10 AUGUST 2021
Date of Issue : 11 AUGUST 2021

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21079
Job No. : VC64AC0058
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	8846A	1997025	EEL-BP, 06/0264	05-Feb-22
Digital Multimeter	33461A	MY53220116	EEL-BP, 04/0264	10-Feb-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).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21079
Job No. : VC64AC0058
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. : ACL21079
Job No. : VC64AC0058
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)
14.8

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

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.8
Flat	23.5

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	0.6	0.7	0.7	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21079
Job No. : VC64AC0058
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	-0.2	-0.2	-0.1	±2.0
125	-0.1	-0.1	-0.1	±1.5
250	-0.1	-0.1	-0.1	±1.5
500	-0.1	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz:

Frequency Weighting	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	93.9	94.0	0.1	± 0.3

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21079
Job No. : VC64AC0058
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	136.1	0.1	±1.1
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±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	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	25.0	0.0	±1.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21079
Job No. : VC64AC0058
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	116.9	-0.1	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	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	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

Continuation of Calibration Certificate

Cert. No. : ACL21079
Job No. : VC64AC0058
Pages : 8 of 8

11. Overload indication

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

12. High level stability

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

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



Cert. No. : ACL21080
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00597169 / 180411 / 88181
ID No.: RYG_FS0439

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 AUGUST 2021
Calibration Date : 06-10 AUGUST 2021
Date of Issue : 11 AUGUST 2021

Calibrated by : Nathakorn Pisutpaisan

Approved by : T. Petchurai
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21080
Job No. : VC64AC0058
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	8846A	1997025	EEL.BP. 06/0264	05-Feb-22
Digital Multimeter	33461A	MY53220116	EEL.BP. 04/0264	10-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	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. : ACL21080
Job No. : VC64AC0058
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. : ACL21080
Job No. : VC64AC0058
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)
14.4

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

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.5
Flat	23.0

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.3	0.3	± 1.5
1000	0.0	0.0	0.1	± 1.0
8000	1.3	1.4	1.4	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21080
Job No. : VC64AC0058
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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. : ACL21080
Job No. : VC64AC0058
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	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.8	-0.2	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21080
Job No. : VC64AC0058
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
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	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21080
Job No. : VC64AC0058
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

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



Cert. No. : ACL22026
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00900071 / 188464 / 01733
ID No.: RYG-FS0492

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

REVIEW BY : *Nathakorn P.*
APPROVED BY : *T. Petchurai*
NEXT CAL. DATE : 10/1/23

Calibrated by : Nathakorn Pisutpaisan

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

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22026
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	1500-07774E	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).

QH-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22026
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

QH-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22026
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)
14.8

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

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.8
Flat	23.6

3. Acoustical signal tests of frequency weightings

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

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

QH-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22026
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	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

QH-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22026
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	33.9	-0.1	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.8	-0.2	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL22026
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	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 _{peak} (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	133.1	0.1	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL22026
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		
89.6	89.5	-0.1	±1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchur

451-451/1 Sirinthon 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. : ACL22158
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No. : 00472127 / 169440 / 72461
ID No. : RYG_FS0302

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



Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22158
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),

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22158
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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22158
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)
17.3

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

Frequency Weighting	Measured value (dB)
A - weight	12.0
C - weight	18.1
Flat	23.9

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	0.0	0.0	0.1	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	0.4	0.4	0.5	±5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22158
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	-0.1	-0.1	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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. : ACL22158
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	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	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

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL22158
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	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±3.0

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

QF-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL22158
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	(dB)	(dB)
89.6	89.5	-0.1	±1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchur

451-451/1 Sirinthon 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. : ACL22060
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00734225 / 169439 / 72460
ID No. : RYG-FS0030

Condition As Found : GOOD

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

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 14 JANUARY 2022
Calibration Date : 21-24 JANUARY 2022
Date of Issue : 25 JANUARY 2022

REVIEW BY: *Manon P.*
APPROVED BY: *[Signature]*
NEXT CAL. DATE: 31/1/23

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22060
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	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	I-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).

QF-TS12-04-04-020664

T. R. P. H.

Continuation of Calibration Certificate

Cert. No. : ACL22060
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	✓	-	0.4	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. R. P. H.

Continuation of Calibration Certificate

Cert. No. : ACL22060
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)
14.2

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

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	17.2
Flat	23.0

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.4	0.5	0.5	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-1.6	-1.5	-1.5	±5.0

QF-TS12-04-04-020664

T. R. P. H.

Continuation of Calibration Certificate

Cert. No. : ACL22060
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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)			Acceptance Limits
	Flat	C-weight	A-weight	
63	0.0	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	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

T. R. P. H.

Continuation of Calibration Certificate

Cert. No. : ACL22060
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	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

QF-TS12-04-04-020664

T. R. R. A.

Continuation of Calibration Certificate

Cert. No. : ACL22060
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	134.0	0.0	± 1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	± 1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	± 1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (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	133.0	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. R. R. A.

Continuation of Calibration Certificate

Cert. No. : ACL22060
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	89.5	-0.1 ; ± 1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

Q. D. T. A.

CERTIFICATE OF CALIBRATION

ISSUED BY: Cirrus Research plc
DATE OF ISSUE: 07/09/21
CERTIFICATE NUMBER: 162335

REVIEW BY: *Nigel Smith*
APPROVED BY: *Nigel Smith*
NEXT CAL. DATE: 7/9/22

Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 1
Test engineer:
Nigel Smith
Electronically signed:
Nigel Smith

doseBadge Reader

Instrument

Manufacturer: Cirrus Research plc
Model Number: RC:110A
Serial Number: 89107
Notes:

Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 07 September 2021

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Initial	113.90	1000.2	0.20
Adjusted	114.00	1000.2	0.20
Uncertainty	± 0.11	± 0.14	± 0.10
Tolerances	± 0.60	± 2.00	± 4.00

Environmental Conditions

Pressure: 101.40 kPa
Temperature: 22.4 °C
Humidity: 60.2 %

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

ISSUED BY: Cirrus Research plc
DATE OF ISSUE: 02/12/21
CERTIFICATE NUMBER: 166913

Page 1 of 1

Cirrus Research plc
Acoustic House
Bridlington Road
Hunnamby
North Yorkshire
YO14 0PH
United Kingdom

Test engineer:
Rebecca Thomas
Electronically signed:



doseBadge Reader

Instrument

Manufacturer: Cirrus Research plc
Model Number: RC-110A
Serial Number: 76062
Notes:

Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 01 December 2021

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

REVIEW BY: 
APPROVED BY: 
NEXT CAL DATE: 1/12/22

Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Initial	114.20	1000.9	0.35
Adjusted	113.99	1000.9	0.34
Uncertainty	± 0.11	± 0.14	± 0.10
Tolerances	± 0.60	± 2.00	± 4.00

Environmental Conditions

Pressure: 98.75 kPa
Temperature: 22.4 °C
Humidity: 43.9 %

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.



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

Certificate of Calibration

Represent to Certificate of Calibration ,PTC/07/22104

Certificate No.: PTC/07/22104
Equipment: Digital Balance
Manufacturer: Sartorius
Model: MSE125P-100-DU
Type of Balance: Single interval

Page: 1 of 3
Condition: Normal
Serial No: 33108993
ID No: RYG_EN0004

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/m³

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. Rungroje Metakul



REVIEW BY: 
APPROVED BY: 
NEXT CAL DATE: 22/06/23




(Mr. Kriangsak Kalasri)
Reviewed by

Approved By: 
(Mr. Keattisak Kerdto)
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 recognised 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 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/MC-07-02: 2 Feb 2020



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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

Eccentricity test		Position (g)				
50 (g)		1	2	3	4	5
		0.00000	-0.00004	-0.00001	0.00000	0.00001
		Maximum deviation: 0.00004				

Repeatability Test: Weight to be 1/2 ≤ L₁ ≤ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
50	0.000007

Error of indication: from nominal value., Readability 0.00001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.000000	0.00000	0.00000	0.000020	2.65
0.01	0.010001	0.01000	0.00000	0.000022	2.17
0.05	0.050002	0.04999	0.00001	0.000022	2.17
0.1	0.099999	0.09999	0.00001	0.000022	2.17
0.5	0.500001	0.50001	-0.00001	0.000022	2.17
1	1.000004	0.99999	0.00001	0.000022	2.14
2	1.999999	1.99999	0.00001	0.000022	2.14
5	5.000015	4.99999	0.00002	0.000023	2.14
10	10.000004	10.00000	0.00000	0.000024	2.10
20	20.000029	20.00000	0.00003	0.000032	2.00
50	50.000043	49.99999	0.00005	0.000069	2.00

Note: Weight of adjust (g)

PTC/MC-07-02: 2 Feb 2020



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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

Eccentricity test		Position (g)				
50 (g)		1	2	3	4	5
		0.00000	0.00000	0.00000	0.00000	0.00000
		Maximum deviation: 0.00000				

Repeatability Test: Weight to be 1/2 ≤ L₁ ≤ 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	65.00000	0.00001	0.00013	2.00
70	70.00007	70.00000	0.00001	0.00013	2.00
75	75.00009	75.00000	0.00001	0.00014	2.00
80	80.00008	80.00000	0.00001	0.00014	2.00
85	85.00009	85.00000	0.00001	0.00015	2.00
90	90.00010	90.00000	0.00001	0.00015	2.00
95	95.00012	95.00000	0.00001	0.00016	2.00
100	100.00004	100.00000	0.00000	0.00014	2.00
110	110.00004	110.00000	0.00000	0.00015	2.00
120	120.00007	120.00000	0.00001	0.00016	2.00

Note: Weight of adjust (g)

The End of Certificate

PTC/MC-07-02: 2 Feb 2020



บริษัท เอกเสควิฟ เทคคิง จำกัด (สำนักงานใหญ่)
48/194-5 ซอยประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงตลาดพร้าว เขตตลาดพร้าว กรุงเทพฯ 10230
TEL (662) 515-0145-50 FAX (662) 515-0144 www.etthai.com E-mail : info@etthai.com

ที่ RA 013/22

ใบรายงานผลการปรับเทียบ

ชื่อผู้ขอรับบริการ : บริษัท เอกเสควิฟ เทคคิง จำกัด (ประเทศไทย) จำกัด.
ที่อยู่ : 104 ซ.พัฒนาการ 40 ถ.พัฒนาการ แขวงสวนหลวง เขตสวนหลวง กรุงเทพมหานคร 10250.
ปรับเทียบที่ : บริษัท เอกเสควิฟ เทคคิง จำกัด
ที่อยู่ : 48/194-5 ซอย ประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงตลาดพร้าว กรุงเทพฯ 10230

รายละเอียดเครื่องมือที่ทำการปรับเทียบ : สภาวะแวดล้อม :
เครื่องมือ : เครื่องตรวจวัดไอระเหยจากสารเคมี อุณหภูมิ : $(25 \pm 3) ^\circ\text{C}$
ผลิตภัณฑ์ : RAE Systems ความชื้นสัมพัทธ์ : $(36 \pm 15) \%$
รุ่น : MiniRAE3000 ความดันบรรยากาศ : 760 มิลลิเมตรปรอท
หมายเลขเครื่อง : 592-906493
ID : BKK_FS0819

วันที่ปรับเทียบมาตรฐาน : 4 กุมภาพันธ์ 2565
วิธีการปรับเทียบมาตรฐาน : ปรับเทียบโดยใช้ Standard Reference Gas Hydrocarbon GASCO
- Isobutylene Standard Gas 100 ppm; Lot number: 304-402089381-1.

ผลการปรับเทียบมาตรฐาน

Sensor Type	Reference Concentration	Before Cal.	After Cal.	Error Reading	Result
PID	0.0 ppm (Air Zero)	0.0 ppm	0.0 ppm	0.0 ppm	Pass
PID	100 ppm (Isobutylene)	54.1 ppm	100.0 ppm	0.0 ppm	Pass

Flow Rate of Pump : 490 cc/min.
Accuracy : $\pm 2 \%$ at calibration point

ผู้ปรับเทียบ : สุรินทร์ ส. (นายสุรินทร์ สาธิตพร)
ผู้ตรวจสอบ : สุทธิวงศ์ กองทองสังข์ (นายสุทธิวงศ์ กองทองสังข์)
Service Engineer Service Engineer Manager

ผลการสอบเทียบปรับเทียบ นี้ มีผลเฉพาะตัวเครื่องและผลการวิเคราะห์ที่ได้เท่านั้น
การนำรายงานผลการปรับเทียบไปโฆษณาหรือการนำข้อมูลส่วนใดไปเผยแพร่ต่อสาธารณะโดยไม่ได้รับอนุญาตเป็นลายลักษณ์อักษรจากบริษัทฯ

EXECUTIVE TRADING LIMITED 48/194-5 SOI PRADITMANUTHAM 19, PRADITMANUTHAM ROAD, LATPHRAO, BANGKOK 10230

บริษัท เอกเสควิฟ เทคคิง จำกัด (สำนักงานใหญ่)
48/194-5 ซอยประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงตลาดพร้าว เขตตลาดพร้าว กรุงเทพฯ 10230
TEL (662) 515-0145-50 FAX (662) 515-0144 www.etthai.com E-mail : info@etthai.com

No. RA 013/22

Certificate of Calibration

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
Address : 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang Bangkok 10250 TH.
Calibration location : Executive Trading Limited.
Address : 48/194-5 Soi Praditmanutham 19, Pradit Manutham Road, Latphrao, Bangkok 10230

Tools : Environmental Condition :
Instrument : Gas Detector Temperature : $(25 \pm 3) ^\circ\text{C}$
Product : RAE Systems Relative Humidity : $(36 \pm 15) \%$
Model Name : MiniRAE3000 Pressure : 760 mmHg
Serial Number : 592-906493
ID : BKK_FS0819

Date of Calibration : February 4, 2022
Calibration Method : This instrument has been calibrated using calibration gases. Test and calibration data is On file with Executive trading limited.
Reference Standard : Isobutylene Standard Gas 100 ppm; Lot number: 304-402089381-1.

Test Result

Sensor Type	Reference Concentration	Before Cal.	After Cal.	Error Reading	Result
PID	0.0 ppm (Air Zero)	0.0 ppm	0.0 ppm	0.0 ppm	Pass
PID	100 ppm (Isobutylene)	54.1 ppm	100.0 ppm	0.0 ppm	Pass

Flow Rate of Pump : 490 cc/min.
Accuracy : $\pm 2 \%$ at calibration point

Calibrated By : สุรินทร์ ส. (Mr. Surin S. Sainate) Service Engineer
Approved By : สุทธิวงศ์ กองทองสังข์ (Mr. Suttiwong Kongtongsang.) Service Engineer Manager

The results relate only to the items tested or calibrated.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the company.

EXECUTIVE TRADING LIMITED 48/194-5 SOI PRADITMANUTHAM 19, PRADITMANUTHAM ROAD, LATPHRAO, BANGKOK 10230

บริษัท เอกเสควิฟ เทคคิง จำกัด (สำนักงานใหญ่)
48/194-5 ซอยประดิษฐ์มนูธรรม 19 ถนนประดิษฐ์มนูธรรม แขวงตลาดพร้าว เขตตลาดพร้าว กรุงเทพฯ 10230
TEL (662) 515-0145-50 FAX (662) 515-0144 www.etthai.com E-mail : info@etthai.com

ที่ RA 013/22

ใบรายงานการตรวจเช็คเครื่องตรวจวัดก๊าซ รุ่น MiniRAE3000

หมายเลขเครื่อง : 592-906493 วันที่ตรวจเช็ค : 4 กุมภาพันธ์ 2565

ลำดับที่	รายละเอียดการตรวจสอบ	RAW COUNT		สรุป	หมายเหตุ
		REF.	REAL		
1.	PID RAW COUNT				
	Ch.H	10000-62500	39643	■ YES □ NO	
	Ch.L	<62500	29542	■ YES □ NO	
2.	Lamp	>40	45	■ YES □ NO	

ลำดับที่	รายละเอียดการตรวจสอบ	การแก้ไข	สรุป	หมายเหตุ
1.	Motor Pump	Check flow rate	■ YES □ NO	490 cc/min.
2.	Buzzer	-	■ YES □ NO	-
3.	Li-ion Battery	-	■ YES □ NO	-
4.	Key Pad			
	Y/+	-	■ YES □ NO	-
	N/-	-	■ YES □ NO	-
	MODE	-	■ YES □ NO	-
5.	LCD Display	-	■ YES □ NO	-
6.	THP sensor	-	■ YES □ NO	-
7.	Light Sensor	-	■ YES □ NO	-
8.	Pocket Clip	-	□ YES □ NO	-
9.	PC Port	-	■ YES □ NO	-
10.	Slim Rubber Boot	-	■ YES □ NO	เปลี่ยนใหม่

ผู้ตรวจเช็ค : สุรินทร์ ส. (นายสุรินทร์ สาธิตพร) Service Engineer

ผลการสอบเทียบปรับเทียบ นี้ มีผลเฉพาะตัวเครื่องและผลการวิเคราะห์ที่ได้เท่านั้น
การนำรายงานผลการปรับเทียบไปโฆษณาหรือการนำข้อมูลส่วนใดไปเผยแพร่ต่อสาธารณะโดยไม่ได้รับอนุญาตเป็นลายลักษณ์อักษรจากบริษัทฯ

EXECUTIVE TRADING LIMITED 48/194-5 SOI PRADITMANUTHAM 19, PRADITMANUTHAM ROAD, LATPHRAO, BANGKOK 10230



GASCO AFFILIATES, LLC.

320 Scarlet Blvd.
Oldsmar, FL 34677
(800) 910-0051
fax: (866) 755-8820
www.gascogas.com

CERTIFICATE OF ANALYSIS

Date: May 14, 2021 Customer: R C Systems Co Inc
Order Number: 58376
Lot Number: 304-402089381-1 Use Before: 05/14/2025

Component	Requested Concentration	Analytical Result (+/- 2%)
Isobutylene	100 PPM	101.2 PPM
Air	Balance	Balance

Cylinder Size: 3.70 Cu. Ft.
Contents: 105 Liter
Valve: 5/8"-18 UNF
Pressure: 1200 psig

Product composition verified by direct comparison to calibration standards traceable to NIST, weights and/or NIST Gas Mixture reference materials.

Analyst

[Signature]
Brendan Brown

Honeywell Analytics - Singapore Office
17 Changi Business Park Central 1
Singapore 486073
Cert Ref: 00317



Honeywell THE POWER OF CONNECTED | Gas Detection

CERTIFICATE Of Attendance

It is hereby certified that

Mr Suttiwong Kongthongsang
(Executive Trading Limited)

has attended the

RAE Products & Maintenance Training Course

Conducted by

RAE Systems BY HONEYWELL

on **31st July to 2nd August 2018**

[Signature]
[Stamp]

Conducted by: Desmond Tan
Service Engineer/Technical Trainer
Date of Issue: 2nd August 2018
Valid for 2 years from date of issue



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



CERTIFICATE OF CALIBRATION

Certificate No.: CL-021-65
Page 1 of 2

Equipment Name: Heat Stress Monitor with Sensor
Manufacturer: DeltaOHM
Model: HD32.2
Serial No: 18018313
ID No: RYG_FS0358

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

Received date: 10 JAN 2022
Calibration date: 16 FEB 2022
Issue date: 17 FEB 2022

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 29 Mar 2022
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 04 June 2022

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

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

Traceability
The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0036-21, Certificate number: ER-0032-
21

REVIEW BY: *[Signature]*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 16/2/23

Calibrated by
☒ Mr. Sorawit Thechalad
☐ Miss Orathai Wiwitwattaya



Approved Signatory: *[Signature]*
Mr. Parinya Booncharoen
Calibration Department Manager



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



Certificate No.: CL-021-65
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 18021467,
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.046	20.1	0.1	0.099
30	25.050	25.1	0.1	0.099
30	30.036	30.1	0.1	0.099
30	35.027	35.1	0.1	0.099
30	40.024	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 18021270,
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.049	20.0	0.0	0.099
70	24.993	25.1	0.1	0.099
70	29.932	29.9	0.0	0.099
70	34.848	34.4	-0.1	0.099
70	39.819	39.6	-0.2	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 18020497,
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.045	20.1	0.1	0.099
110	25.050	25.1	0.1	0.099
110	30.037	30.1	0.1	0.099
110	35.026	35.1	0.1	0.099
110	40.023	40.1	0.1	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No.: CL-005-65
Page 1 of 2

Equipment Name: Heat Stress Monitor with Sensor
Manufacturer: DeltaOHM
Model: HD32.2
Serial No: 18018314
ID No: RYG_FS0359

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

Received date: 12 JAN 2022
Calibration date: 24 JAN 2022
Issue date: 25 JAN 2022

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 25 Mar 2022
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 04 June 2022

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

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

Traceability
The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0036-21, Certificate number: ER-0032-
21



Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Orathai Wiwatwittaya



Approved Signatory: [Signature]
Mr. Parinya Booncharoen
Calibration Department Manager

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HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Certificate No.: CL-005-65
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C
Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 18021465.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.050	20.0	0.0	0.099
30	25.039	25.0	0.0	0.099
30	30.030	30.0	0.0	0.099
30	35.025	34.9	-0.1	0.099
30	40.019	39.9	-0.1	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 18021262.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.049	20.1	0.1	0.099
70	24.966	24.8	-0.2	0.099
70	29.925	29.7	-0.2	0.099
70	34.889	34.5	-0.4	0.099
70	39.850	39.4	-0.5	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 20008280.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.050	20.0	0.0	0.099
110	25.039	25.0	0.0	0.099
110	30.030	30.0	0.0	0.099
110	35.025	35.1	0.1	0.099
110	40.019	40.1	0.1	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★



CERTIFICATE OF CALIBRATION

Certificate No.: CL-022-65
Page 1 of 2

Equipment Name: Heat Stress Monitor with Sensor
Manufacturer: DeltaOHM
Model: HD32.2
Serial No: 18018316
ID No: RYG_FS0360

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

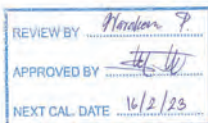
Received date: 10 JAN 2022
Calibration date: 16 FEB 2022
Issue date: 17 FEB 2022

Reference Used During Calibration
1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 25 Mar 2022
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 04 June 2022

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

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

Traceability
The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0036-21, Certificate number: ER-0032-
21



Calibrated by
☒ Mr. Sorawit Thachalad
☐ Miss Orathai Wiwatwittaya



Approved Signatory: [Signature]
Mr. Parinya Booncharoen
Calibration Department Manager

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HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Certificate No.: CL-022-65
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 - 40 °C
Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 18021471.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.054	20.0	-0.1	0.099
30	25.043	25.0	0.0	0.099
30	30.038	30.0	0.0	0.099
30	35.029	35.0	0.0	0.099
30	40.027	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 18021266.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.049	20.1	0.1	0.099
70	25.002	25.0	0.0	0.099
70	29.928	29.8	-0.1	0.099
70	34.878	34.6	-0.3	0.099
70	39.855	39.5	-0.4	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 18020502.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.054	20.1	0.0	0.099
110	25.042	25.1	0.1	0.099
110	30.036	30.1	0.1	0.099
110	35.030	35.1	0.1	0.099
110	40.027	40.1	0.1	0.099

UUC*: Unit Under Calibration

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

★ End of Certificate ★





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
334/4 PATTANAKARN ROAD SOI 16, SUANLIANG, SUANLIANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22CH377
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : SevenGo
Serial No.: B531256371
ID No.: RYG_FS0420
Condition As-Received: Used Item
Received Date : 11 March 2022
Calibration Date : 14 March 2022
Reference : 2203-0495DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5 T. Maenam Khu, A. Muakdaeng, Rayong 21140, Thailand
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)

REVIEW BY *P. Pichan*
APPROVED BY *S. S.*
NEXT CAL DATE *14/03/23*

Calibrated by : Warakorn Lornnggatrakul

Approved by : *W. L.*
Approved Signatory

(✓) Malee Butkruea
() Sathip Meangmai
() Warakorn Lornnggatrakul

Issue Date : 17 March 2022

The Uncertainties are for a confidence probability of approximately 95%

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A 0039308



Cert. No.: 22GH377
Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument :
Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 54030049 130RC116 21E2682 25 Aug 2022
This certification is traceable to the International System of Unit maintained at -
Traceable to National Institute of Metrology (Thailand), NIMT

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	766820	23 Sep 2023
pH 6.983	CPA chem	766822	04 Sep 2022
pH 10.015	CPA chem	766824	04 Sep 2022

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value		Standard Voltage Input		Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH	mV	pH		
pH Meter	4.00	177.48	177	4.00	0.58	2.00		
S/N: B531256371	7.00	0.00	0	7.00	0.58	2.00		
	10.00	-177.48	-178	10.00	0.58	2.00		

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode	4.008	4.01	181	0.0079	2.00
S/N: 1311407	6.983	6.98	7	0.0093	2.00
	10.015	10.01	-171	0.0082	2.00

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

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A 1100595



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



Cert. No.: 22LM41
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Mettler Toledo
Model : SevenGo
Serial No.: B531256371
ID No.: RYG_FS0420
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
(Rayong Branch)
616/10 Moo 5 T. Maenam Khu, A. Muakdaeng, Rayong 21140 Thailand
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 : Malee Butkruea

Approved by : *M. B.*
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



Cert. No.: 22LM41
Page.: 2 of 2

Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2203-0495DSC-2

Procedure Used :-

Calibration was 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	2168080	211273	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 :- (°C) 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* 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	30.6	0.492	0.16	2.00
40.0	100	39.997	40.6	0.603	0.16	2.00
50.0	100	49.997	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 %.

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A 1100597



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 Sirithean
Approved by :
Approved Signatory
() Malee Butkruea
(✓) Sathip Meangmai
() Warakorn Lengagtrakul
Issue Date : 18 February 2022

REVIEW BY
APPROVED BY
NEXT CAL. DATE 15/8/23

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

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a 1094744



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 :
Approved Signatory
() Pornthippa Tameyakul
(✓) Malee Butkruea
() 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 3 : Equipment Calibration and Testing Services.

A 0038008



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

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

Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1523	2169080	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 %.

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a 1095714



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TEL: 0-2717-3000-37 FAX: 0-2719-9484



Certificate of Calibration

Cert. No.: 22TM317
Page: 1 of 3

Equipment : Low Temp. Incubator

Manufacturer : Memmert

Model : IPP750

Serial No. : V818.0084

ID No. : RYG_EN0154

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

Location : BOD Room

Received Order : 22 April 2022

Calibration Date : 22 April 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

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 3: Equipment Calibration and Testing Services.

A 0040735



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1
Procedure Used :-

Cert. No.: 22TM317
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement
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	MY44031769	21LM12	02 Sep 2022

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

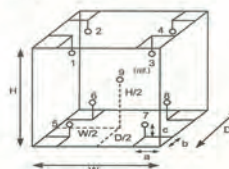
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	58
AC Supply (Volt)	221	223



Probe Installation Details :

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

Dimension of Chamber :

D = 0.60 m
W = 1.0 m
H = 1.2 m
Capacity = 0.75 m³

Position :	Ref. Std. ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

a 1106485



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM317
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
20.0	20.0	20.0	0.022	0.20	0.22	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.209	20.174	20.199	20.110	20.075	20.062	20.027	20.069	20.030

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 %.

-o0o-

a 1106484



Certificate of Calibration

Equipment : SPECTROPHOTOMETER
Model : DR8000
Serial No. (or ID.): 1627845 (RYG_EN0037)
Manufacturer : HACH
Condition : In Condition

Certificate No.: C08220484
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.Pluaekdaeng, Rayong 21140, Thailand.

REVIEW BY
APPROVED BY
NEXT CAL DATE 27/13/24

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.Pluaekdaeng, Rayong 21140, Thailand.

Calibration By : Mr. Chattaphon Folthong
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 Starna 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. Chattaphon Folthong)
Person in charge

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

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

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Phone: +66 2039 1000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CALFM-C08-13: 20 Jul 2022

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
	0.6693	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
590 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	-0.0009	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	0.0046
	0.9823	0.983	-0.0007	0.0045

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 (0) 2069-7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

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CAL-FM-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
	0.2895	0.292	-0.0025	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6381	0.638	0.0001	0.0080
Stray light *				
Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)	
260.67 +/- 0.11 nm	260.7	2.1	1.678	
391.94 +/- 0.11 nm	391.9	1.7	1.770	
Spectral Resolution *				
Nominal Concentration 0.02 % w/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.60	266.63	1.39	2.00
UUC: Wavelength (nm)	268.2	266.1		
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

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DKSH Technology Limited
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CAL-FM-C06-13: 20 Jul 2022

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2212224

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR6000 หมายเลขเครื่อง: 1627845

ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (ตั้ง)		หมายเหตุ
27 Sep 2022			27 Sep 2022		
ปกติ	ไม่ปกติ		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. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	656.1 nm 656.1 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. ช่องวัดหลายตัวอย่าง (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. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไมครอน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สลัก 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. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เซ็นเซอร์อุณหภูมิ:

Mr. Chattaphon Folthong
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
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CAL-FM-R31-03: 20 Jul 2022

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:	26207038
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	± 0.3 °C
	Humidity	58.1 %RH	± 4.4 %RH
	Air density	1.17	kg/m ³

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 Euramei cg. 18
Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co., Ltd.,
NSC-ONSAC 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.Knagsak Kalasri)
Reviewed by

Approved By : (Mr. Keattisak Kerdto)
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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Represent to Certificate of Calibration ,PTC/07/22103

Certificate No.: PTC/07/22103

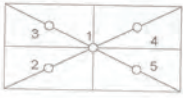
Page: 2 of 2

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 $1/2 \leq L_1 \leq$ Maximum capacity

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

Nominal test value (g)	Standard Deviation
200	0.00003

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	0.000086	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	2.05
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	2.00

Note: Weight of adjust (g)

The End of Certificate

PTC-FMC-07-02-27 Feb. 2020



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SEANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2713-3000-27 FAX: 0-2719-9484



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)
618/10 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 :
Approved Signatory

() Ponthippa Tameyakul
(x) Malee Butkrues
() 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-1 : Equipment Calibration and Testing Services.

A 0046908



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-2

Cert. No.: 22TM1517
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY49023932	22LM97	29 Jul 2023

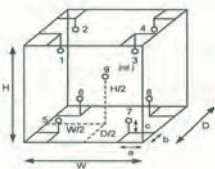
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	59
AC Supply (Volt)	223	225

Ref. Std. ID No.: @ Calibration Point		
Position :	(180) °C	(104) °C
1	21-16TC-01	20-16RTD-01
2	21-16TC-02	20-16RTD-02
3	21-16TC-03	20-16RTD-03
4	21-16TC-04	20-16RTD-04
5	21-16TC-05	22-16RTD-05
6	21-16TC-06	20-16RTD-06
7	21-16TC-07	20-16RTD-07
8	21-16TC-08	22-16RTD-08
9 (ref.)	21-16TC-09	22-16RTD-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-2

Cert. No.: 22TM1517
Page : 3 of 3

Result of Calibration :-

(*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.076	0.52	0.60	0.42	2
180.0	180.0	180.0	0.13	0.88	1.2	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
104.0	103.788	103.734	103.723	103.800	104.215	104.131	104.132	103.740	103.747
180.0	179.723	179.359	179.439	179.489	180.361	180.114	180.131	180.243	179.605

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 %.

-000-

a 1132466

a 1132466



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-27 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 Hiahib
Approved by :
() Pornthippa 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 3 : Equipment Calibration and Testing Services.

A 0046905



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0376OC-1

Cert. No.: 22TM1492
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-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.

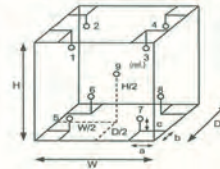
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	43	47
AC Supply (Volt)	220	221



Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.33 m
W = 0.40 m
H = 0.40 m
Capacity = 0.053 m³

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 : 2210-0376OC-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

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
70.0	70.262	69.995	70.079	70.177	70.664	70.039	70.688	70.149	70.328

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-27 FAX: 0-2719-9484



Cert. No.: 22TM1491
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNB22
Serial No. : L513.0648
ID No. : RYG_EN00061
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 Hiahib
Approved by :
() Pornthippa 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 3 : 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

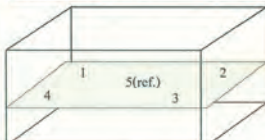
2. This certificate is valid only to the item calibrated on date and place of calibration.

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.)	
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

Mela

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				
			1	2	3	4	5 (ref.)
85.0	85.0	85.0	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 %.

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Mela

a 1132470



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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Cert.No.: 22CH405
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven Compact S220
Serial No. : C104059460
ID No. : RYG_EN0183
Condition As-Received : Used Item
Received Date : 16 March 2022
Calibration Date : 17 March 2022
Reference : 2203-0611DSC-4
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Rayong Branch
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

REVIEW BY N. Bangkit
APPROVED BY D. J.
NEXT CAL. DATE 17/3/23

Calibrated by : Warakorn Lemgagtrakul

Approved by : Mela
Approved Signatory

(/) Malee Butkruea
() Saithip Meangmai
() Warakorn Lemgagtrakul

Issue Date : 22 March 2022

The Uncertainties are for a confidence probability of approximately 95%

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A 0037307



Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	21E2682	25 Aug 2022
2) Ref. Standard Thermometer	4982054	110RC044	21I1201	28 Oct 2022

This certification is traceable to the International System of Unit maintained at:-

- Traceable to National Institute of Metrology (Thailand), NIMT

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	788995	01 Jan 2024
pH 6.982	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	766824	04 Sep 2022

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: C104059460	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Mela

a 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	6.988	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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Malu

a 1100954



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL: 0-2717-3000-24 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

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.

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
816/10 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:

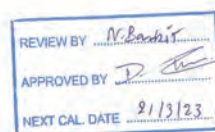
Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6440007	21E1444	07 May 2022

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: Pongsagorn Boonyaporn
Issue Date: 22 March 2022

Approved Signatory:

Phalinee Prabpaipal
Nuntawat Khamchai
Pomthippa Tameyakul

b 0284414



Cert. No.: 22E986
Page: 2 of 2

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

Function: DC voltage measurement

Range:

2000

mV

Standard Value (mV)	UUC* Reading (mV)	Error (mV)	Uncertainty (\pm μ 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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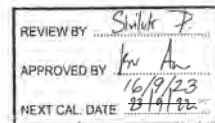
Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Ramad Road
Silom Bangkok Bangkok Thailand 10500
Tel: 02-6324300 Fax: 02-6375466-7
www.barscientific.com



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No.: BSCG-UV-30722
Equipment: UV/Vis Spectrophotometer
Model: UV-1800
Manufacturer: Shimadzu
Serial No.: A11454908533CD
ID No.: BKK_EN0018
Date of receipt: 16 September 2022
Date of calibration: 16 September 2022
Date of issue: 23 September 2022



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

Address: 104 Soi Phatthanakan 40, Phatthanakan Road, Phatthanakan, Suan Luang, Bangkok 10250

Temperature: (22.1-23.3) °C (On site)
Humidity: (58.8-63.2) %RH (On site)

Equipment condition: Good Operation

Calibration Location: Organic Prep

Calibration Procedure: In-house method W-UV-702-01 based on ASTM E275-01

Traceability: Wavelength Accuracy is traceable to certificate No. 95917 and 95918
Photometric Accuracy is traceable to certificate No. 95924 and 95937
Stray Light is traceable to certificate No. 95908
The above certificate are traceable to SI unit through Stama Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by: Mr Waiyuth Jangthung

Approved by

Mr.Kanchit Choothep
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Certificate of Calibration

Certificate No. **BSCC-UV-307/22** Number of Page(s) **2 of 3**

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
241.70	241.65	-0.05	0.18
334.02	333.92	-0.10	0.18
418.53	418.46	-0.07	0.18
572.99	572.96	-0.03	0.18
879.41	879.17	-0.24	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7467	0.7461	-0.0006	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8662	0.8647	-0.0015	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2904	0.2911	0.0007	0.0075
350	0.0000	0.0000	0.0000	0.0075
	0.8429	0.8426	-0.0003	0.0075

*CNR = Customer not request

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FM-LV-708-02 Rev 01 (23/01/63)

Certificate of Calibration

Certificate No. **BSCC-UV-307/22** Number of Page(s) **3 of 3**

Calibration Results:

3.Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5783	0.5777	-0.0006	0.0042
	0.7628	0.7635	0.0007	0.0046
	1.0296	1.0230	-0.0066	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5621	0.5618	-0.0003	0.0042
	0.7455	0.7460	0.0005	0.0048
	0.9985	1.0005	0.0020	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5227	0.5219	-0.0008	0.0042
	0.6880	0.6884	0.0004	0.0051
	0.9487	0.9503	0.0016	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5207	0.5199	-0.0008	0.0042
	0.6973	0.6971	-0.0002	0.0049
	0.9959	0.9964	0.0005	0.0042
580.0	0.0000	0.0000	0.0000	0.0042
	0.5544	0.5534	-0.0010	0.0042
	0.7253	0.7242	-0.0011	0.0050
	1.0942	1.0943	0.0001	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5616	0.5606	-0.0010	0.0042
	0.6927	0.6921	-0.0006	0.0053
	1.0851	1.0855	0.0004	0.0042

*CNR = Customer not request

4.Stray Light*

Standard cut-off wavelength (nm)	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.96±0.11nm	200.30	0.9505	2.0229

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

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

End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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FM-LV-708-02 Rev 01 (23/01/63)

ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๔๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

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

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

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)
จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ น้ำใต้ดิน
จำนวน ๑๒๖ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๑ รายการ ตามสิ่งที่ส่งมาด้วย ๓

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

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิริะ จันทรเจต)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพาพร จันทร์เปล่ง

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๐

๒) นางสาวชนัญ โคมารกุล ณ นคร

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๑

๓) นายศรายุทธ จิตรานนท์

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๒

๔) นางสาวกนกกร เอนก

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๑

๕) นายสุริยา สอนแก้ว

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๒

๖) นายวิชาญ ชูณหรัตน์

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๓



(นายศิริระ จันทร์เจิด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

๑) นางสาวจินดา ไชจุลธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๘
๒) นางสาวสาวิตรี น้อยเสงี่ยม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๙
๓) นางสาวชนัญญาญจน์ อัมมขม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๐
๔) นางสาวนรินทร์ สายเส็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๕
๕) นางสาวนันทวดี สมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๖
๖) นางสาวศรัณยา เฉลิมธำรงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๗
๗) นางสาวสรารักษ์ มงคลจิรวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙
๘) นางสาวศิริลักษณ์ พึ่งแพง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๒๐
๙) นายณพพงศ์ จันทรพันธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๐๘
๑๐) นายนรเศรษฐ์ โกมลาลัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๑
๑๑) นายธันวา จริยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๔
๑๒) นางสาวเกศรินทร์ แก้วมัน	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๖
๑๓) นางสาวสุวิมล ชัยเรืองวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๗
๑๔) นางสาวสุชาดา ธรรมถาวร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๑
๑๕) นางสาวเบมิกา ชัยเดชธนกุล	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๓
๑๖) นางสาวศศิธร หมูสวัสดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๔
๑๗) นางสาวเสาวลักษณ์ ภู่นภาอำพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๕
๑๘) นายอภิสิทธิ์ สิงหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๖
๑๙) นายศักดิ์สิทธิ์ ไพศาลพิสุทธิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๗
๒๐) ว่าที่ร้อยตรีหญิง พรรณิภา ขำเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๘
๒๑) นางจิตดา คำภูแก้ว	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๓๑
๒๒) นางสาวอรรวรรณ รักยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๕
๒๓) นางสาวนพรัตน์ แยมกรานต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๙
๒๔) นายจุลเดช วารินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๐
๒๕) นางสาวดาญรัตน์ ร้องคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๑
๒๖) นายนคร สุขเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๒
๒๗) นายบัญชา นามเขตต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๓
๒๘) นายพรมมี ศรีปัตเนตร	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๕
๒๙) นายอุทิศ อุ่นสิม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๖
๓๐) ว่าที่ร้อยตรี เฉลิมเกียรติ อมรศรีเสริม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๘
๓๑) นางสาววริยา สร้างนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๙
๓๒) นายอนุพงศ์ รัตนศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๓๐
๓๓) นางสาวจุฑารัตน์ โอนสันเทียะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๔๒
๓๔) นางสาวจรรววรรณ พิมพ์อริกฤติยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๖

(นายศิระ จันทร์เจิด)

๓๕) นางสาวปรารค์ทิพย์...

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

สำนักงานสิ่งแวดล้อมและเฝ้าระวังมลพิษทางอากาศ

๓๕) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๙
๓๖) นางสาวเดือนใจ ทางกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๐
๓๗) นางสาวจิราพร ศิริเวช	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๑
๓๘) นายวรกร ผูกרך	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๒
๓๙) นายทอง วิริยะสทกิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๓
๔๐) นายธนิต เจนจบ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๔
๔๑) นายคณิศร ขำเพชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๕
๔๒) นายอรรคพล นิยมวิทยาพันธ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๖
๔๓) นายภูวิช พรหมสะอาด	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๗
๔๔) นายธนเดช โภคาพิพัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๘
๔๕) นายชวฤทธิ์ วงษ์จันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๙
๔๖) นายอาทิตย์ ศรีแสน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๐
๔๗) นายเจษฎินทร์ คงศักดิ์ไทย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๑
๔๘) นายจรัส บุญยั้ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๒
๔๙) นายธนาณัติ เอนก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๓
๕๐) นายอภิวัฒน์ ทุมหนู	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๔
๕๑) นางสาวสุภาขวัญ มาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๕
๕๒) นางสาวหัตถพร ขวาลสมบุรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๐
๕๓) นางสาวธิดิมา บุญเพ็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๑
๕๔) นางสาวกนกอร เข้มเพ็ชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๒
๕๕) นางสาวพัชรียา หงษ์สมดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๓
๕๖) นางสาวภาวนิดา สุรวงศ์ตระกูล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๔
๕๗) นางสาวภาณุมาศ นามวัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๕
๕๘) นางสาวอุไรรัตน์ ทิงสร้างแป้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๖
๕๙) นายธีรวัฒน์ ปวงสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๗
๖๐) นายอิทธิพล ยะโส	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๘
๖๑) นายประพจน์ วรรณชูชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๙
๖๒) นายชยธร พวงทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๐
๖๓) นางสาวกนกวรรณ จันทบาล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๑
๖๔) นางสาวเกษร หลักบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๒
๖๕) นายสิทธิโชค ธงเงิน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๓
๖๖) นางศิลปวรรณ ใจบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๕
๖๗) นางสาวพรรณธิดา พุ่มคง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๘
๖๘) นางสาวศรณีย์ ยิ่งดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๙
๖๙) นายนวกัทร ศรีวิริยะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๐
๗๐) นายสุวิชา ทองอ่อน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๑
๗๑) นายวิญญู บุญตะนัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๓

(นายศิระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

กระทรวงอุตสาหกรรม

๗๒) นายสมบุรณ์...

๑๐๙) นายนนทชัย...

๑๐๙) นายพนนพชัย อุปถัมภ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๔
๑๑๐) นายณัฐพล คุณสุทธิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๕
๑๑๑) นายณันทวัฒน์ สาริน	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๖
๑๑๒) นายปิยะนัฐ พลมะศรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๗
๑๑๓) นายพงศ์สิริ โสมเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๘
๑๑๔) นายพีรพัฒน์ กำคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๙
๑๑๕) นายภาณุพงศ์ มานิตย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๐
๑๑๖) นายมงคล ผลาทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๑
๑๑๗) นายมนุรินทร์ พูลศิริ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๒
๑๑๘) นายสิรินันท์ ทองอ้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๓
๑๑๙) นายอเนชา ทันสมัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๔
๑๒๐) นายอดิศักดิ์ ผมไผ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๕
๑๒๑) นายอนันตชัย วิสุม	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๖
๑๒๒) นายณัฐดนัย เจือละออง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๗
๑๒๓) นายวรวิธ คีนัก	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๘
๑๒๔) นายแสงตะวัน นະตะສັດ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๙
๑๒๕) นายยุทธพงศ์ รัตนะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๐
๑๒๖) นายชัยวุฒิ ไชยชนะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๑
๑๒๗) นายวิศรุต ศรีธรรมมา	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๒
๑๒๘) นายพนนทกร เผือกผ่อง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๓
๑๒๙) นายกำชัย สุทธะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๔
๑๓๐) นางสาวณัฐภรณ์ รักทะเล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๑๙
๑๓๑) นางสาวประภาภรณ์ บุตรพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๐
๑๓๒) นางสาวนิลาวัลย์ นามพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๑
๑๓๓) นางสาวพัชรินทร์ แสนสร้อย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๒
๑๓๔) นายไพโรจน์ เปี่ยมพิมาย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๓
๑๓๕) นางสาวศุภมาศ ทองมาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๔
๑๓๖) นางสาวลลิตา จิตรสว่าง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๕
๑๓๗) นางสาวชไมพร เสิกภูเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๖
๑๓๘) นางสาวกฤติมาพร คำมีแก่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๗
๑๓๙) นางสาวสกลรัตน์ ภาควุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๘
๑๔๐) นางสาวกาญจนา คงคุณ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๙
๑๔๑) นางสาวไพรินทร์ ศรีรูปี	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๐
๑๔๒) นางสาวทิพนันดา ฝูญปัญญา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๑
๑๔๓) นางสาวสาธิตา ปานทอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๒
๑๔๔) นางสาวอริสา ทองนวล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๓
๑๔๕) นางสาวอริยา คำคลอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๔

(นายศิริ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

๑๔๖) นางสาวบุษดาภรณ์...

๑๔๖) นางสาวชุตติภรณ์ สุนทรสนาน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๕
๑๔๗) นางสาวสุภารัตน์ นนท์ประสาท	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๖
๑๔๘) นางสาวรัชนิกร เนียมกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๗
๑๔๙) นางสาวกัญญารัตน์ ศรีนิลทา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๘
๑๕๐) นางสาวอัญชลี คำจันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๙
๑๕๑) นายบุญฤทธิ์ เอี่ยมเทศ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๐
๑๕๒) นายศิริวัฒน์ พานิชย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๑
๑๕๓) นางสาวศุภรดา ปันมยุรา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๒
๑๕๔) นางสาวพาฤดี คุณน่าน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๓
๑๕๕) นางสาวจิราเจต พองดา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๔
๑๕๖) นางสาวกนกภรณ์ อุระ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๕
๑๕๗) นางสาวอารยา มีชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๖
๑๕๘) นางสาวจิตสุภา ประเทืองสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๗
๑๕๙) นางสาวอริสา วิริยขันติธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๘
๑๖๐) นางสาววิษุตา นาคผจญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๙
๑๖๑) นางสาวพนิดา ยอดอินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๐
๑๖๒) นางสาวนันทิยา จันทะสุน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๑



(นายศิริระ จันท์เจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

น้ำเสีย จำนวน 59 รายการ

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

(นางริกาญจน์ จันทรกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

19 Copper...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
20	Cyanide	Distillation, Colorimetric Method ^[4]
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
33	Formaldehyde	Distillation, Colorimetric Method ^[3]
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ^[4] 2) Iodometric Method ^[4]
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
37	Hexavalent Chromium	Filtration, Colorimetric Method ^[4]
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ^[4]
39	Lead	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma/Mass spectrometric Method ^[4]
42	Methiocarb	High-Performance Liquid Chromatographic Method ^[4]
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]

วิมล

44 Methomyl...

(นางริกาญจน์ อัครสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
กรมส่งเสริมการเกษตร

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
44	Methomyl	High-Performance Liquid Chromatographic Method ^[4]
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ^[4] 2) Soxhlet Extraction Method ^[4]
47	Oxamyl	High-Performance Liquid Chromatographic Method ^[4]
48	Propoxur	High-Performance Liquid Chromatographic Method ^[4]
49	pH	Electrometric Method ^[4]
50	Phenols	1) Distillation, Chloroform Extraction Method ^[4] 2) Distillation, Direct Photometric Method ^[4]
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
52	Sulfide	Iodometric Method ^[4]
53	Temperature	Laboratory and Field Methods ^[4]
54	Total Dissolved Solids	Dried at 180 °C ^[4]
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ^[4]
56	Total Suspended Solids	Dried at 103-105 °C ^[4]
57	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
58	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ^[4]
59	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4]

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]

วิมล

3 Aldrin...

(นางริภาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

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

วิธีทาง)

18 Bis(2-ethylhexyl)phthalate...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

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

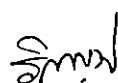


34 Chromium (III)...

(นางริกาญจน์ จิตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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



(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

68 Fluorene...

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

ร.พ.ว.

84 Methanol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

แบบฟอร์มแจ้งผลการวิเคราะห์

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4] 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^[4]
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
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 ^[4]

วิมล

97 Pentachlorophenol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

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

วิมล

114 1,1,2-Trichloroethane...

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

อากาศเสีย (ปล่อยระบาย) จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]

วิฑูรย์

3 Carbon Monoxide...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และหน่วยงานที่เกี่ยวข้อง

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

วิมล

สิ่งปลูก...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

กรมควบคุมมลพิษ

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

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

วิมล

6 Cadmium...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

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



(นางริกาญจน์ จิตรสกุลวิไล)

11 Cobalt...

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

.....เรียน...../.....

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

จิรพร

2) Soxhlet...

(นางริกาญจน์ จัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

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

วิมล

2) Waste Extraction...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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

วิมล

27 Polychlorinated...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	<p>Polychlorinated biphenyls (PCBs)</p> <ul style="list-style-type: none"> - 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',5,5',6-Nonachlorobiphenyl 	<p>1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method^[1,9,23]</p> <p>2) Soxhlet Extraction, Gas Chromatographic Method^[10,23]</p> <p>3) Automated Soxhlet Extraction, Gas Chromatographic Method^[22,31]</p>

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

28 Pentachlorophenol...

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

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

4) Digestion...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]

ดิน จำนวน 125 รายการ

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

วิมล

(นางริกาณจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

9 Benz(a)anthracene...

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

วิกรม

26 Carbon tetrachloride...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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

วิฑูรย์

(นางวิภาณูจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

40 DDE...

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

วิภาณี

57 Dieldrin...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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

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

วิฑูรย์

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และหน่วยงานบังคับปฏิบัติการ

2) Thermal...

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

วิฑูรย์

(นางวิภาณีย์ ฉัตรสกุลวิไล)

- Aroclor 1242...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	<ul style="list-style-type: none"> - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl 	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]

วิกรม

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

101 Selenium...

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

วิมล

116 2,4,6-Trichlorophenol...

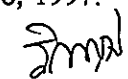
(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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

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(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ



ที่ อก ๐๓๑๐(๓)/ ๖๔๗๐

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๘ มิถุนายน ๒๕๖๕

เรื่อง ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๙ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำ
ห้องปฏิบัติการวิเคราะห์ และรายการสารมลพิษที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลборาทอรี กรุ๊ป
(ประเทศไทย) จำกัด ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่
๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู้ อำเภอลวกแดง จังหวัดระยอง โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

- | | | |
|--------------------------|---------------|--------------|
| ๑) นายเดช ช้างชน | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๒ |
| ๒) นางวิลาวัลย์ บริรักษ์ | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๓ |
| ๓) นายสุพจน์ สลามเต๊ะ | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๔ |

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

- | | | |
|---------------------------------|---------------|--------------|
| ๑) นางสาวนฤมล บรรจงกิจ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๕ |
| ๒) นางพจนา สีดา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๖ |
| ๓) นางสาวธนิดา กุลสุริวงศ์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๗ |
| ๔) นายพิทยา ทองแดง | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๘ |
| ๕) นางชลธิชา สุนงข | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๙ |
| ๖) ว่าที่ ร.ต.รณชัย ม่วงมา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๐ |
| ๗) นายวรารุณ ทัพพา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๑ |
| ๘) นายศักดิ์รินทร์ จรัสกาย | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๒ |
| ๙) นายสุรศักดิ์ สาชิน | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๓ |
| ๑๐) นางสาวเพชรคุณ ภาภูตานนท์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๔ |
| ๑๑) นายสถาพร ถาแก้ว | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๕ |
| ๑๒) นายสุทธิดำรงค์ โชคปิตินันท์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๖ |

๑๓) นายวัลลภ หันไชยเนาว์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๗
๑๔) นางสาววนาลี เจริญตระกูล	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๘
๑๕) นางสาวนิตา ผดุงจิตต์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๙
๑๖) นายธนะสิทธิ์ วงศ์ไชย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๐
๑๗) นายชัยนุสรณ์ เลิศนันทกุลชัย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๑
๑๘) นายสัจจา เพ็ชรแสง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๒
๑๙) นายกันตภณ มณีสัมพันธ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๓
๒๐) นางสาวจันทนีย์ โกเมนชนะ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๔
๒๑) นายธารินทร์ อ็อกจินดา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๕
๒๒) นายศุภณัฐ พิสัยพันธ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๖
๒๓) นายศุภชัย วงศ์สุริย์ฉาย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๗
๒๔) นายปฐมพงศ์ กรสวัสดิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๘
๒๕) นายไสว ตันโพธิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๙
๒๖) นางสาวกิตติยา สัญญาอริยาภรณ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๐
๒๗) นางสาวเจษฎาพร ศรีบุญเรือง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๑
๒๘) นางสาวมธุรินทร์ สิงห์เงา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๒
๒๙) นางสาวธิดารัตน์ ศิริมั่งคะโร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๓
๓๐) นายพิพัฒน์ นิภัทร์เศรษฐ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๔
๓๑) นายศิริวิทย์ เรืองสม	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๕
๓๒) นายปารามศ สัตยาคุณ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๖
๓๓) นายนฤนาท ธรรมสโร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๗
๓๔) นางสาวศุภรัตน์ โสจันทร์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๘
๓๕) นายพชรกร อินทรเสนา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๙
๓๖) นายทิวากร เชื้อมาก	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๐
๓๗) นายอนุรักษ์ ทองขจรศักดิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๑
๓๘) นายอภิชาติ วิชาศ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๒
๓๙) นายจรัสระวี ศรีรักษา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๓
๔๐) นายประสานมิตร เชื้อนเพชร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๔
๔๑) นายภาณุวัฒน์ วังบง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๕
๔๒) นายสันติ ชัยชนะ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๖
๔๓) นายสิทธิชัย แก้วเกตุ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๗
๔๔) นายทินกร กุลชาติ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๘

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๑๔ รายการ
 อากาศเสีย (ปล่องระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๔ รายการ
 ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางจินดา เตชะศรีนทร์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๒๘ มิ.ย. ๒๕๖๔

กองวิจัยและเตือนภัยมลพิษโรงงาน

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๓๒๓

ที่ ออก ๐๓๑๐(๓)/

๖๔๗๐

ลงวันที่

๒๘

มิถุนายน

๒๕๖๔

ขอขยาสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ
น้ำเสีย จำนวน 14 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[2] 2) 5-Day BOD Test, Azide Modification Method ^[2]
2	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method ^[2] 2) Closed Reflux, Colorimetric Method ^[2] 3) Closed Reflux, Titrimetric Method ^[2]
3	Color	ADMI Weighted – Ordinate Spectrophotometric Method ^[2]
4	Cyanide	Distillation, Colorimetric Method ^[2]
5	Formaldehyde	Distillation, Colorimetric Method ^[1]
6	Free Chlorine	DPD-Ferrous Titrimetric Method ^[2]
7	Oil and Grease	Liquid-Liquid Partition-Gravimetric Method ^[2]
8	pH	Electrometric Method ^[2]
9	Phenols	1) Distillation, Chloroform Extraction Method ^[2] 2) Distillation, Direct Photometric Method ^[2]
10	Sulfide	ZnS Precipitation, Iodometric Method ^[2]
11	Temperature	Laboratory and Field Method ^[2]
12	Total Dissolved Solids	Dried at 180 °C ^[2]
13	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ^[2]
14	Total Suspended Solids	Dried at 103-105 °C ^[2]

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[5] 2) Instrumental Analyzer Method ^[8]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
3	Opacity	Ringelmann's Method ^[3,4]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[6] 2) Instrumental Analyzer Method ^[9]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[10]

วิภา สัมฤทธิ์ผล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

Sulfuric Acid...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Sulfuric Acid	Isokinetic Sampling, Barium – Thorin Titrimetric Method ^[6]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[7]

น้ำใต้ดิน จำนวน 3 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method ^[2]
2	pH	Electrometric Method ^[2]
3	Phenols	Distillation, Direct Photometric Method ^[2]

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วิภา สัมฤทธิ์ผล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก