

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ



ALS Laboratory Group (Thailand) Co., Ltd.
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 Bangkok 10250 Thailand
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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Songkhla Lab	BOD (5 days at 20°C)	Incubator	SGK_CL0028	11-Feb-21	12-Aug-22	18
Songkhla Lab	BOD (5 days at 20°C)	DO/BOD Analyser	SGK_CL0073	2-Dec-21	2-Dec-22	12
Songkhla Lab	COD	COD Reactor	PTC/10/22004	8-Feb-22	8-Feb-23	12
Songkhla Lab	COD	Spectrophotometer	SGK_CL0038	24-Jan-22	24-Jan-23	12
Songkhla Lab	pH at 25 °C	pH meter	SGK_CL0030	9-Nov-21	10-May-23	18
Songkhla Lab	Oil & Grease	Electronic Top-Loading Balance	SGK_CL0045	5-Feb-22	5-Feb-23	12
Songkhla Lab	Oil & Grease	Oven	SGK_CL0025	9-Nov-21	10-May-23	18
Songkhla Lab	Oil & Grease	Water Bath	SGK_CL0035	5-Feb-22	6-Aug-23	18
Songkhla Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	SGK_CL0045	5-Feb-22	5-Feb-23	12
Songkhla Lab	Total Dissolved Solids 180°C	Oven	SGK_CL0024	9-Nov-21	10-May-23	18
Songkhla Lab	Total Suspended Solids	Electronic Top-Loading Balance	SGK_CL0045	5-Feb-22	5-Feb-23	12
Songkhla Lab	Total Suspended Solids	Oven	SGK_CL0024	9-Nov-21	10-May-23	18
Ambient	Benzene	GC-MSD	RYG_EN0136	2-Feb-21	2-Aug-22	18
Ambient	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0619	18-Oct-21	18-Oct-22	12
Ambient	Total Hydrocarbon	Total Hydrocarbon Analyzer	BKK_EN0057	9-Feb-21	9-Aug-22	18



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.: 21TM331

Page.: 1 of 3

Certificate of Calibration

Equipment :	Incubator
Manufacturer :	Memmert
Model :	ICP 750
Serial No. :	F816.0063
ID No. :	SGK_CL0028
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch 114/1 Moo 8 Kanjanavanij Rd., Banphru, Hatyai, Songkhla 90250 Thailand
Location :	BOD Room
Received Order :	10 February 2021
Calibration Date :	11 February 2021
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
Calibrated by :	Khit Ruttanaprapachai
Approved by :	<u>Malee Butkruea</u> Approved Signatory
	() Pornthippa Tameyakul (<input checked="" type="checkbox"/>) Malee Butkruea () Suwit Imjai
Issue Date :	19 February 2021

REVIEW BY	Sutthirak T.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	12/8/22

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 0024671



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2102-0248OC-3

Cert. No.: 21TM331

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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023932	20LM6	NIST, NIMT	20 Apr 2021

2. This certification is traceable to the SI unit.

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

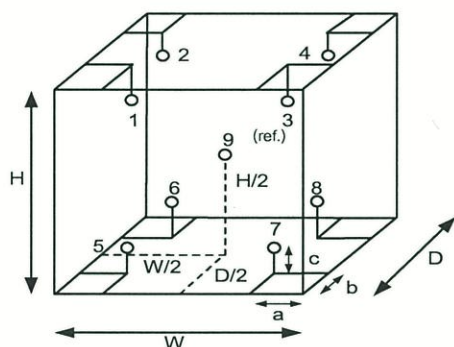
Remark : NIST : National Institute of Standards and Technology, The United State of America.

NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	21	22
REL.Humid. (%)	46	48
AC Supply (Volt)	220	221

Position :	Ref. Std./ID No.:
1	20-16RTD-01
2	20-16RTD-02
3	20-16RTD-03
4	20-16RTD-04
5	20-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	20-16RTD-08
9 (ref.)	20-16RTD-09

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 = 0.72 m³

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2102-0248OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM331

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 <i>k</i>
20.0	20.0	20.0	0.10	0.32	0.62	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.294	20.186	20.327	20.313	20.058	20.105	20.008	19.863	20.109

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES


534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

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

Cert.No.: 21TW256

Page.: 1 of 2

Certificate of Testing

Equipment :	DO Meter	<div>REVIEW BY Preetiya P. APPROVED BY Kanitha H. NEXT CAL. DATE 2/12/2022</div>
Manufacturer :	YSI	
Model :	5000	
Serial No. :	17B101473	
ID No. :	SGK_CL0073	
Received Date :	01 December 2021	
Test Date :	02 December 2021	
Reference :	2112-0025DSC-1	
Submitted by :	ALS Laboratory Group (Thailand) Co.,Ltd. Songkhla Branch. 114/1 Moo 8 Karnchanawanich Rd., T.Ban Phru, A.Hat Yai, Songkhla 90250 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 :	<div> Approved Signatory</div>	
(/) Malee Butkruea		
() Saithip Meangmai		
() Warakorn Lerngagtrakul		
Issue Date :	6 December 2021	



Cert.No.: 21TW256

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 17B100103

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.12	8.11	0.0055

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

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Cert. No.: 21LM26

Page.: 1 of 2

Certificate of Calibration

Equipment :	DO Meter with Sensor	<div>REVIEW BY <u>Preeiya P.</u> APPROVED BY <u>Kanitta H.</u> NEXT CAL DATE <u>2/8/12/2022</u> <u>512</u></div>
Manufacturer :	YSI	
Model :	5000	
Serial No. :	17B101473	
ID No. :	SGK_CL0073	
Submitted by :	ALS Laboratory Group (Thailand)Co.,Ltd. Songkhla Branch 114/1 Moo 8 Karnchanawanich Rd., T.Ban Phur, A.Hat Yai, Songkhla 90250 Thailand	
Location :	On Site Calibration Service Laboratory	
Received Order :	1 December 2021	
Calibrated Date :	6 December 2021	
Ambient Temperature :	(26 ± 10) °C	
Relative Humidity :	(50 ± 30) %	
AC Line Voltage :	(220 ± 22) V	
Calibrated by :	Man Pattanapongpaiboon	
Approved by :	<u>Malee</u> Approved Signatory	
<input type="checkbox"/> Pornthippa Tameyakul <input checked="" type="checkbox"/> Malee Butkruea <input type="checkbox"/> Suwit Imjai		
Issue Date :	9 December 2021	

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 0032821



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2112-0025DSC-1

Cert. No.: 21LM26

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:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1502A	A52847	21I1144	20 Oct 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.: 17B100103

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
20.00	60	20.001	19.96	-0.041	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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Certificate of Calibration

Certificate No.:	PTC/10/22004	Page:	1 of 4
Equipment:	Cod Reactor	Condition:	New
Manufacturer:	Hach	Serial No. :	21120C1313
Model:	DRB200	ID No. :	-
Covers:	None	Holes:	30

Environment Condition:	Temperature:	25.2	°C	±	0.1	°C
	Humidity:	49.5	%RH	±	1.1	%RH
	Voltage:	221.8	VAC	±	0.6	VAC

Customer: ALS LABORATORY GROUP (THAILAND)
114/1 Moo.8, Karnchanawanich Rd., T.Ban Phru,
A.Hat Yai, Songkhla 90250 Thailand.

Calibration Place: Penta Calibration Co., Ltd. (Temperature Laboratory)
66/124 The connect 34 Village, Kanchanaphisek Road,
Dokmai, Prawet Bangkok 10250 Thailand

The Method used: In house method, PTC-WI-10, based on Compare with Standard Thermometer

Traceability: This certificate is traceable to the SI Units through Quality Reborn Co.,Ltd ,
NSC-ONSC Accreditation No.: Calibration 0292

Date Received: February 08, 2022
Date Calibrated: February 08, 2022
Date Issued: February 08, 2022
Calibrated By: Mr. Todsapol Moolsuang

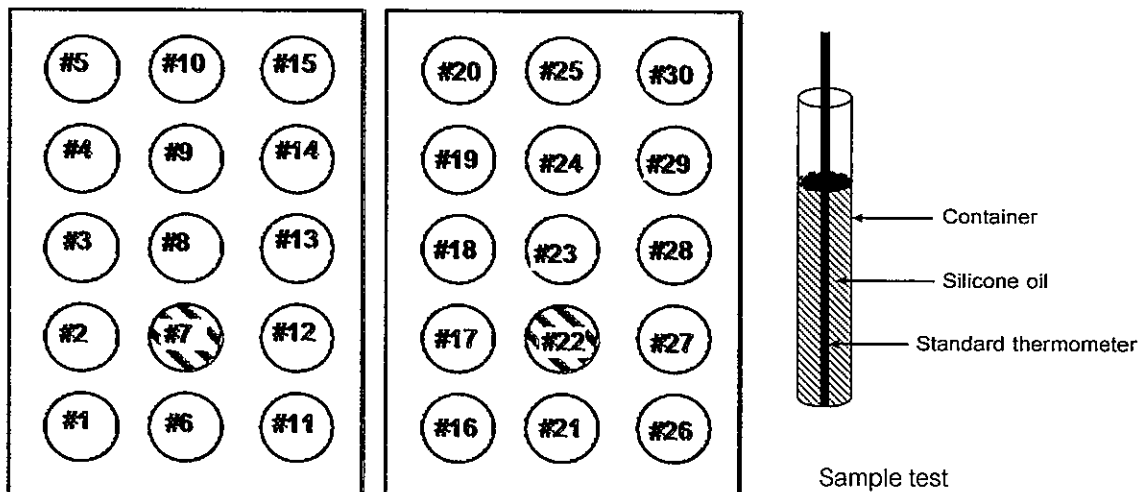
(Mr.Kriangsak Kalasri)

Reviewed by

Approved By :

(Mr. Keattisak Kerdto)

Laboratory Manager



Standard Installation Position:

Module	1									
Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Probe No.	1	2	3	4	5	6	7	8	9	10

Module	2									
Position of Std	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20
Probe No.	1	2	3	4	5	6	7	8	9	10

Module	2									
Position of Std	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30
Probe No.	1	2	3	4	5	6	7	8	9	10

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



Measurement Results:

Without adjustment

Position heating block	Calibration point (°C)	Setting (°C)	UUC Reading (°C)
Left	150	150	150

Measurement Temperature (°C) @ Probe No.			
Position	Standard Reading (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	150.77	0.77	0.64
#2	149.49	-0.51	0.63
#3	150.38	0.38	0.63
#4	150.28	0.28	0.63
#5	149.74	-0.26	0.63
#6	150.94	0.94	0.64
#7	149.01	-0.99	0.64
#8	150.82	0.82	0.64
#9	149.49	-0.51	0.63
#10	149.11	-0.89	0.63
#11	149.31	-0.69	0.64
#12	150.73	0.73	0.64
#13	150.48	0.48	0.64
#14	149.13	-0.87	0.63
#15	149.19	-0.81	0.64

UUC Characterization

UUC Setting (°C)	UUC Reading (°C)	Measured Uniformity (°C)	Measured Stability (± °C)
150	150	1.55	0.12

Note: UUC = Unit Under Calibration

Definitions

UUC Reading : The average reading of indicating device which forms the integral part of UUC.

Standard Reading : The average reading of standards at any positions or location.

Measured Uniformity : The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with any holes of UUC at steady-state. The reference probe is preferably located in the geometric center of UUC.

Measured Stability : The one-half of greatest maximum difference of measured temperatures at any one probe.



Measurement Results:

Without adjustment

Position heating block	Calibration point (°C)	Setting (°C)	UUC Reading (°C)
Right	150	150	150

Measurement Temperature (°C) @ Probe No.			
Position	Standard Reading (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#16	149.46	-0.54	0.64
#17	149.79	-0.21	0.64
#18	149.27	-0.73	0.64
#19	150.14	0.14	0.64
#20	149.38	-0.62	0.64
#21	150.81	0.81	0.64
#22	150.80	0.80	0.65
#23	150.71	0.71	0.64
#24	149.86	-0.14	0.64
#25	149.23	-0.77	0.64
#26	150.61	0.61	0.64
#27	149.10	-0.90	0.64
#28	150.71	0.71	0.64
#29	149.10	-0.90	0.64
#30	150.74	0.74	0.64

UUC Characterization

UUC Setting (°C)	UUC Reading (°C)	Measured Uniformity (°C)	Measured Stability (± °C)
150	150	1.55	0.12

Note: UUC = Unit Under Calibration

Definitions

UUC Reading : The average reading of indicating device which forms the integral part of UUC.

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Measured Uniformity : The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with any holes of UUC at steady-state. The reference probe is preferably located in the geometric center of UUC.

Measured Stability : The one-half of greatest maximum difference of measured temperatures at any one probe.

The End of Certificate



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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Cert.No.: 22CHO32

Page.: 1 of 3

Certificate of Calibration

Equipment : UV-VIS Spectrophotometer
Manufacturer : Hach
Model : DR 3900
Serial No. : 1687645
ID No. : SGK_CL0038
Condition As-Received: Used Item
Received Date : 24 January 2022
Calibration Date : 24 January 2022
Reference : 2201-0617OC-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
Songkhla Branch
114/1 Moo 8, Kanjanavanij Rd., Banphru, Hatyai,
Songkhla 90250 , Thailand
Calibration Place : Chemistry Room
Ambient Temperature : (24.9 - 25.2) °C (On-Site)
Relative Humidity : (39.2 - 45.2) % (On-Site)
Calibration Procedure : In - house method :
CP-OCH4 based on ASTM E 275-01
Calibrated by : Kunchit Promprat

REVIEW BY	Ananta B.
APPROVED BY	Kanitta B.
NEXT CAL. DATE	24/1/23

Approved by :

Malee

Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date :

7 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 0037403



Cert. No. : 22CHO32

Page : 2 of 3

Condition of calibration result

1. Reference Standard Material :

<u>Material</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1. Absorbance Standard set	8331	86623	08 Sep 2022
2. Wavelength Standard set	29829	94776	02 Sep 2023
3. Wavelength Standard set	29829	94777	02 Sep 2023

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

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

- National Physical Laboratory (NPL), The United Kingdom of Great Britain and Northern Ireland
- National Institute of Standards and Technology (NIST), The United States of America

4. Spectral BandWidth : 5 nm
Scan Speed : - nm/min

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (± nm)	Coverage Factor <i>k</i>
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	514	0.59	2.00
537.00	536	0.59	2.00
638.00	638	0.59	2.00
747.61	748	0.59	2.00
807.04	807	0.59	2.00

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Cert. No. : 22CHO32

Page : 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (\pm Abs)	Coverage Factor <i>k</i>
420.0	Zero	0.000	0.0028	2.00
	0.5723	0.572	0.0033	2.00
	0.7522	0.751	0.0031	2.00
	1.0907	1.090	0.0033	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5616	0.560	0.0034	2.00
	0.7345	0.732	0.0032	2.00
	1.0646	1.063	0.0033	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5118	0.514	0.0034	2.00
	0.6773	0.679	0.0031	2.00
	0.9809	0.984	0.0033	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5228	0.522	0.0030	2.00
	0.6861	0.684	0.0030	2.00
	0.9941	0.993	0.0030	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5546	0.552	0.0029	2.00
	0.7159	0.712	0.0030	2.00
	1.0369	1.033	0.0030	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5401	0.538	0.0029	2.00
	0.6835	0.680	0.0029	2.00
	0.9889	0.986	0.0030	2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer

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

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CALIBRATION CERTIFICATE

Issued Date : 12-Nov-2021

Certificate No. : 21PH192

CSR No. : A012/00583

Page. : 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Chemical Laboratory

Instrument Name : pH meter

Manufacturer : Mettler Toledo

Model : S220

Serial No. : B625631849

ID No. : SGK_CL0030

Electrode No. : 6404000

Received Date : 9-Nov-2021

Calibrated Date : 9-Nov-2021

Ambient Temperature : $(25 \pm 3) ^\circ\text{C}$

Relative Humidity : $(55 \pm 15) \%$

REVIEW BY	Suttharak T.
APPROVED BY	Kanitta H.
CAL. DATE	10/05/2023

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.008 based on direct measurement by using certified reference Material (CRM)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- HACH : LANGE United For Water Quality
- WK : WK Electric Co., Ltd.
- Q Reborn : Quality Reborn Co.,Ltd.

Calibrated by : Jessadagon Lemhud

Approved by :


Sakeereen Heemhad / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Solution	4.005	C02840	1617	24-Aug-2022
Standard Solution	7.000	C02841	1618	24-Aug-2022
Standard Solution	10.012	C02843	1619	24-Aug-2022
Temperature/Electrical Calibrator	MC2-MF	23642	WK2102-006-229	21-Feb-2022
Digital Thermometer With Sensor	1529	B4C223	QR21-2009	15-Sep-2022

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :. (✓) Without Adjustment () After Adjustment

1. Electrical Measurement

Applied Voltage (mV)	pH meter Reading (mV)	Correction (mV)	Uncertainty (± mV)
177.48	177.5	-0.02	0.17
0.00	0.0	0.00	0.13
-177.48	-177.5	0.02	0.17

2. Sample Test Measurement

Standard Buffer Solutions (pH)	pH meter Reading (pH)	Correction (pH)	Uncertainty (± pH)
4.007	3.99	0.017	0.011
6.999	7.02	-0.021	0.014
10.011	10.01	0.001	0.036

3. Temperature Measurement

Cal Point (°C)	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
25	24.93	25.0	-0.07	0.11

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

... End ...



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkhla 90250 Thailand

Tel: 081 599 0417 Fax: 074 805 133 Email: s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 8-Feb-2022

Certificate No. : 22EB149

CSR No. : A023/01123

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Chemical Laboratory
Instrument Name : Electronic Balance
Manufacturer : Sartorius
Model : MSE224S-100-DU
Serial No. : 34705158
ID No. : SGK_CL0045
Resolution : 0.0001 g
Received Date : 5-Feb-2022
Calibrated Date : 5-Feb-2022
Ambient Temperature : (30 ±10) °C
Relative Humidity : (50 ±20) %

REVIEW BY	Ananta B.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	5/02/2023

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.001 based on UKAS LAB 14 : 2015

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- Tcs : Thai Calibration Service Co.,Ltd.

Calibrated by : Imron Rattanaylum

Approved by :

Sakeereen Heemhad / Technical Manager

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Certificate No. : 22EB149

CSR No. : A023/01123

Page. : 2 of 3

Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Standard Weight Set	2mg-2kg	11119514/01	M2107051S	6-Jul-2022

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration : (✓) Without Adjustment () After Adjustment

1. Repeatability

Nominal Value (g)	Standard Deviation (g)
200	0.00000

2. Effect of tare

Nominal Value (g)	Standard Value (g)	Balance Reading (g)	Correction (g)
20	20.0000	20.0000	0.0000
40	40.0001	40.0000	0.0001
60	60.0000	60.0001	-0.0001
80	80.0001	80.0001	-0.0001
100	100.0000	100.0000	0.0000

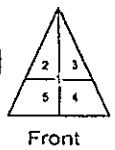
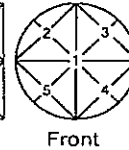
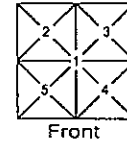
Result of Calibration :

3. Off-centre loading

A mass approximately 50g was placed on a pan and moved to various position .

The balance reading obtained are given in the table.

Position					Maximum Difference (g)
1	2	3	4	5	
50.0000	50.0000	50.0000	50.0000	50.0000	0.0000



4. Departure from nominal value

Nominal Value (g)	Standard Value (g)	UUC Reading (g)	Correction (g)	Uncertainty (\pm g)	Coverage Factor (k)
0.01	0.0100	0.0100	0.0000	0.00008	2.0
0.1	0.1000	0.1000	0.0000	0.00008	2.0
0.5	0.5000	0.5000	0.0000	0.00008	2.0
1	1.0000	1.0000	0.0000	0.00008	2.0
2	2.0000	2.0000	0.0000	0.00008	2.0
5	5.0000	5.0000	0.0000	0.00009	2.0
10	10.0000	10.0000	0.0000	0.00009	2.0
20	20.0000	20.0000	0.0000	0.00009	2.0
50	50.0000	50.0000	0.0000	0.00011	2.0
100	100.0000	100.0000	0.0000	0.00016	2.0
120	120.0000	120.0000	0.0000	0.00024	2.0
140	140.0001	140.0000	0.0001	0.00024	2.0
160	160.0000	160.0000	0.0000	0.00026	2.0
180	180.0000	180.0000	0.0000	0.00029	2.0
200	200.0000	200.0000	0.0000	0.00030	2.0

- UUC = Unit Under Calibration

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

...End...



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkhla 90250 Thailand

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CALIBRATION CERTIFICATE

Issued Date : 12-Nov-2021

Certificate No. : 21OV734

CSR No. : A012/00583

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Chemical Laboratory

Instrument Name : Hot Air Oven

Manufacturer : Memmert

Model : UF110

Serial No. : B416.3392

ID No. : SGK_CL0025

Resolution : 0.1 °C

Received Date : 9-Nov-2021

Calibrated Date : 9-Nov-2021

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 30) %

REVIEW BY	Sutthirak 9.
APPROVED BY	Kamida H.
NEXT CAL. DATE	10/05/2023

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on G-20

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- Q Reborn : Quality Reborn Co.,Ltd.

Calibrated by : Ibrorhim Saleemin

Approved by :

Sakeereen Heemhad / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data logger With Sensor	34970A	MY44064411	QR21-0314	9-Feb-2022

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

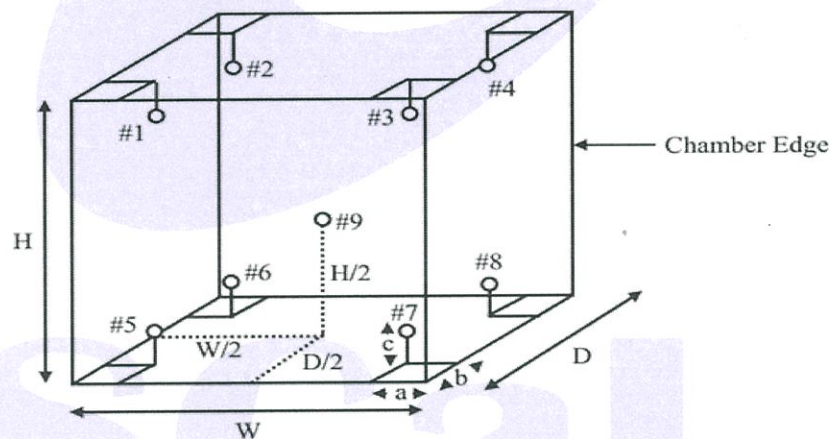
4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :

(✓) Without Adjustment

() After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details

a = 5.0 cm

b = 5.0 cm

c = 5.0 cm

Dimension of the chamber

W = 40.0 cm

H = 40.0 cm

D = 33.0 cm

Result of Calibration :

2. Temperature Measurement Accuracy Test

The measurement results of the Hot Air Oven and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
40	40.28	40.25	39.80	39.87	40.23	40.19	39.97	40.01	40.09	0.36
70	70.34	70.31	70.08	69.64	69.91	69.89	69.84	69.88	69.84	0.36
103	103.17	103.21	102.75	102.67	103.02	103.06	102.80	102.83	102.94	0.36
104	104.31	104.34	103.85	103.77	104.12	104.19	103.92	103.93	104.05	0.36
105	105.13	105.16	104.64	104.60	104.90	104.96	104.65	104.71	104.82	0.36
180	180.31	180.40	180.22	179.77	180.77	180.40	179.69	180.64	180.47	0.41

3. Performance Result

The performance of the Hot Air Oven are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
40	40.0	40.0	0.10	0.30	0.56
70	70.0	70.0	0.10	0.58	0.72
103	103.0	103.0	0.10	0.37	0.56
104	104.0	104.0	0.10	0.41	0.66
105	105.0	105.0	0.20	0.41	0.68
180	180.0	180.0	0.10	0.63	0.81

- UUC = Unit Under Calibration

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

... End ...



Southern Calibration Service Co., Ltd.

669/35 Karnjanavanit Rd., Banpru, Hatyai, Songkhla 90250 Thailand

Tel: 081 599 0417 Fax: 074 805 133 Email: s.calibration@gmail.com www.scal-lab.com



CALIBRATION CERTIFICATE

Issued Date : 8-Feb-2022

Certificate No. : 22WB004

CSR No. : A0223/01123

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Chemical Laboratory
Instrument Name : Water Bath
Manufacturer : Memmert
Model : WNE29
Serial No. : L616.0538
ID No. : SGK_CL0035
Resolution : 0.1 °C
Received Date : 5-Feb-2022
Calibrated Date : 5-Feb-2022
Ambient Temperature : (30 ± 10) °C
Relative Humidity : (50 ± 30) %

REVIEW BY	Ananta B.
APPROVED BY	Kanitta H.
NEXT CAL. DATE	6/07/2023

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.W1.014 based on ASTM E 715 : 1980 (reapproved 2001)

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- Q Reborn : Quality Reborn Co.,Ltd.

Calibrated by : Imron Rattanaylum

Approved by :

Sakeereen Heemhad / Technical Manager

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data logger With Sensor	34970A	MY44064411	QR21-0314	9-Feb-2022

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

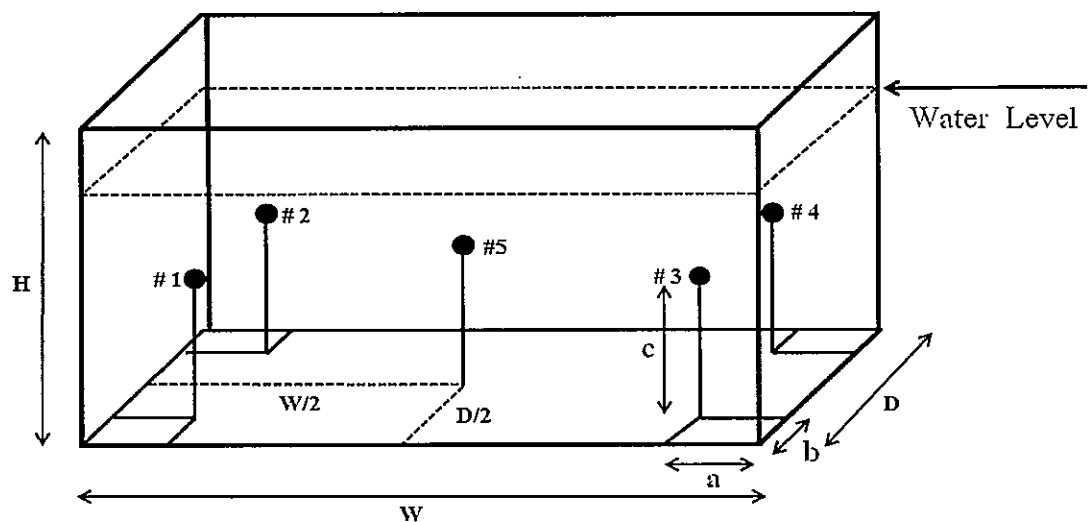
4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :

(✓) Without Adjustment

() After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details

$a = 5$ cm
 $b = 5$ cm
 $c = 5$ cm

Dimension of the chamber

$W = 45$ cm
 $H = 30$ cm
 $D = 35$ cm

Result of Calibration .:

2. Temperature Measurement Accuracy Test

The measurement results of the Water Bath and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)					Uncertainty (± °C)
	#1	#2	#3	#4	Ref.5	
80	79.95	80.07	79.95	79.99	80.03	0.14

3. Performance Result

The performance of the Water Bath are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
80	81.0	81.0	0.10	0.19	0.19

- UUC = Unit Under Calibration

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

... End ...



CALIBRATION CERTIFICATE

Issued Date : 12-Nov-2021

Certificate No. : 21OV733

CSR No. : A012/00583

Page. : 1 of 3

Customer : ALS Laboratory Group (Thailand) Co., Ltd
114/1 Moo 8 Karnchanawanich Rd. T.Ban Phru,
A. Hat Yai, Songkhla 90250 TH

Calibration Place : Chemical Laboratory

Instrument Name : Hot Air Oven

Manufacturer : Memmert

Model : UF110

Serial No. : B416.3387

ID No. : SGK_CL0024

Resolution : 0.1 °C

Received Date : 9-Nov-2021

Calibrated Date : 9-Nov-2021

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 30) %

REVIEW BY Sutthirak O.
APPROVED BY Kanitta H.
NEXT CAL. DATE 10/05/2023

Calibration Method Used :

This instrument was calibrated using the Calibration In - house method : SCAL.WI.012 based on G-20

The Southern Calibration Service Co.,Ltd.calibration control system complies with requirement of ISO/IEC 17025:2017

Traceability of measurement :

This Certificate is traceable to the International and /or national standards which realize the units of measurement according to the International System of Unit (SI) through :

- Q Reborn : Quality Reborn Co.,Ltd.

Calibrated by : Ibrorhim Saleemin

Approved by :

Sakeereen Heemhad / Technical Manager

The uncertainties are for a confidence probability of approximately 95%

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Details of Calibration

1. Reference Standard Equipment Used:

Equipment	Model	Serial No.	Cert. no.	Due Date
Data logger With Sensor	34970A	MY44064411	QR21-0314	9-Feb-2022

2. The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the longterm stability of instrument.

3. This certificate is not certified any commercial transaction

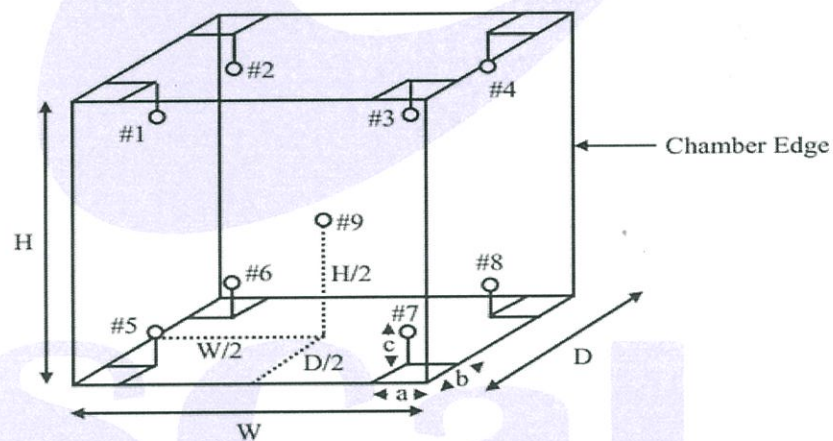
4. Condition of Item : normal condition , no indication for any damage or malfunction

Result of Calibration :

(✓) Without Adjustment

() After Adjustment

1. Sensor Installation Diagram



Sensor Installation Details

a = 5.0 cm

b = 5.0 cm

c = 5.0 cm

Dimension of the chamber

W = 40.0 cm

H = 40.0 cm

D = 33.0 cm

Result of Calibration :

2. Temperature Measurement Accuracy Test

The measurement results of the Hot Air Oven and associates are reported in the manner as shown below

Cal point (°C)	Measured Standard Temperature At Spread Locations (°C)									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
40	39.85	39.81	39.68	39.57	39.94	39.80	39.81	39.93	39.69	0.36
70	70.53	70.23	70.08	69.74	70.51	70.37	70.43	69.79	70.15	0.36
103	103.47	102.96	102.95	102.77	103.40	103.46	103.33	102.73	102.83	0.36
104	104.47	103.92	103.95	103.77	104.33	104.46	104.30	103.73	103.80	0.36
105	105.34	104.85	104.85	104.67	105.16	105.27	105.07	104.81	105.06	0.36
180	180.04	180.03	179.99	179.86	180.11	180.28	180.27	180.16	180.26	0.41

3. Performance Result

The performance of the Hot Air Oven are reported as shown below

Cal point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature Stability (± °C)	Temperature Uniformity (°C)	Overall Variation (°C)
40	40.0	40.0	0.10	0.34	0.47
70	70.0	70.0	0.10	0.48	0.82
103	103.0	103.0	0.10	0.71	0.74
104	104.0	104.0	0.10	0.71	0.74
105	105.0	105.0	0.20	0.39	0.70
180	180.0	180.0	0.20	0.53	0.62

- UUC = Unit Under Calibration

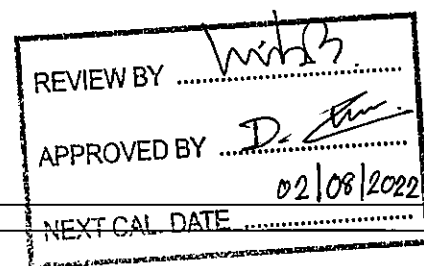
The report uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

... End ...

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: RYG_EN0136
Organization Name: ALS Laboratory Group (Thailand) Co Ltd.
Organization Location: Tambol Pluak Daeng, Amphoe Pluak Daeng, Rayong, 21140, Thailand
Date: February 2, 2021 11:38:25 AM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.50, GCMS.02.50
Overall Qualification Status: Pass



System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front SSL

Setpoint Status: Pass

	Setpoint	Actual
Inlet Pressure:	25.0 psi	25.1 psi
Accuracy:		0.1 psi
Agilent Recommended:		<= 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: February 2, 2021 11:38:25 AM
System ID: RYG_EN0136

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

230.0 231.3 °C

Accuracy:

1.3 °C

Agilent Recommended:

>= -1.0 % setpoint in K (-5.0 °C)

<= 1.0 % setpoint in K (5.0 °C)

Data for this setpoint was entered manually.

Reason:

No Data Logging Software

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

100.0 99.8 °C

Accuracy:

-0.2 °C

Agilent Recommended:

>= -1.0 % setpoint in K (-3.7 °C)

<= 1.0 % setpoint in K (3.7 °C)

Data for this setpoint was entered manually.

Reason:

No Data Logging Software

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name:

7890

Setpoint Status:

Pass

Setpoint/Average

Temperature:

100.0 99.8 °C

Stability:

0.0 °C

Agilent Recommended:

<= 0.5

Data for this setpoint was entered manually.

Reason:

No Data Logging Software

Date:

February 2, 2021 11:38:25 AM

System ID:

RYG_EN0136

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1

Front

SSL

/ External

SQ

Name:

5977B

Setpoint Status:

Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1

Front

SSL

/ External

SQ

Name:

5977B

Setpoint Status:

Pass

Amu:

1050

m/z

Drift After Five Minutes:

1

mV

RFPA Voltage:

475

mV

Agilent Recommended:

>=

-100

and

<=

100

<=

1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1

Front

SSL

/ External

SQ

Name:

5977B

Setpoint Status:

Pass

Filament:

1

Setpoint Status:

Pass

Filament:

2

Overall Tune EI Test Status

Pass

Date:

February 2, 2021 11:38:25 AM

System ID:

RYG_EN0136

Signal to Noise EI

Tested Combination1	Front	SSL	/ External	SQ
---------------------	-------	-----	------------	----

Name:	5977B			
-------	-------	--	--	--

Source:	EI - Extractor
---------	----------------

Filament:	1
-----------	---

Setpoint Status:	Pass
------------------	------

Signal to Noise:	7105
------------------	------

Agilent Recommended:	>= 1200
----------------------	---------

Source:	EI - Extractor
---------	----------------

Filament:	2
-----------	---

Setpoint Status:	Pass
------------------	------

Signal to Noise:	3440
------------------	------

Agilent Recommended:	>= 1200
----------------------	---------

This test's 0 comment(s) and 1 deviation(s) are available in the Attachments section.

Overall Signal to Noise EI Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	RYG_EN0136
Manufacturer	Agilent Technologies
Name	7890

Tested Combination1

Injection Technique	Manual Injection
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN16463238
Firmware Revision	B.02.04.3
Component ID/Asset No.	081117000236
Oven Type	Standard

Inlet 1

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

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977B
Serial Number	US1701M008
Firmware Revision	5977 6.00.34
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std
Component ID/Asset No.	081117000236

MS EI Source 1

Manufacturer	Agilent Technologies
Source Type	EI - Extractor
Number of filaments	2

Electronic Signature

Purpose

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

Details

Full Name of Signer:	Eaknarin Puangsopa
Logged On User Name:	eaknarin_puangsopa@agilent.com
Signature Creation Date:	February 2, 2021
Reason for Signature:	Executed protocol and published this original version of document

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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User Name: eaknarin_puangsoa
 Hostname: ASRYGW7002

System Id: RYG_EN0136
 Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 1, 2021 12:00:51 PM	Audit	SessionCreated	Session	None
February 1, 2021 12:00:51 PM	Start	Configuration	Session	None
February 1, 2021 12:00:51 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
February 1, 2021 12:08:57 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.50/Gc.02.50.eqp], EQP File Name: [Gc.02.50.eqp], EQP Name: [AgilentRecommended] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.50/GcMs.02.50.eqp], EQP File Name: [GcMs.02.50.eqp], EQP Name: [AgilentRecommended]
February 1, 2021 12:09:02 PM	End	Configuration	Session	None
February 1, 2021 12:09:06 PM	Start	Qualification	Session	OQ
February 1, 2021 12:09:07 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None

User Name: eaknarin_puangsoa
 Hostname: ASRYGW7002

System Id: RYG_EN0136
 Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 1, 2021 12:10:04 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1
February 1, 2021 12:10:07 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
February 1, 2021 12:19:39 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
February 1, 2021 12:19:42 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
February 1, 2021 12:28:41 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
February 1, 2021 12:28:44 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
February 1, 2021 12:29:32 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
February 1, 2021 12:29:36 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
February 1, 2021 12:29:41 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None

Page 2 / 5

Date: February 2, 2021 11:38:25 AM
 System ID: RYG_EN0136

User Name: eaknarin_puangsoa
 Hostname: ASRYGW7002

System Id: RYG_EN0136
 Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 1, 2021 12:37:42 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
February 1, 2021 12:37:45 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
February 1, 2021 12:37:51 PM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
February 1, 2021 1:00:14 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
February 1, 2021 1:00:34 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
February 1, 2021 1:01:19 PM	Audit	AceClosed	Session	None
February 2, 2021 9:04:47 AM	Audit	AceRestarted	Session	None
February 2, 2021 9:04:48 AM	Audit	SessionReloaded	Session	None
February 2, 2021 9:04:51 AM	Start	Qualification	Session	OQ
February 2, 2021 9:05:09 AM	Start	Execution	Log Amp - 5977B SQ: - Source: EI - Extractor	None
February 2, 2021 9:15:18 AM	End	Execution	Log Amp - 5977B SQ: - Source: EI - Extractor	Run Count : 1
February 2, 2021 9:15:21 AM	Start	Execution	RFPA - 5977B SQ: - Source: EI - Extractor	None

Page 3 / 5

Date: February 2, 2021 11:38:25 AM
 System ID: RYG_EN0136

User Name: eaknarin_puangsopa
 Hostname: ASRYGW7002

System Id: RYG_EN0136
 Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 2, 2021 9:33:28 AM	End	Execution	RFPA - 5977B SQ: - Source: EI - Extractor	Run Count : 1
February 2, 2021 9:33:30 AM	Start	Execution	Tune EI - 5977B SQ: - Source: - None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	
February 2, 2021 9:35:22 AM	End	Qualification	Session	OQ
February 2, 2021 9:35:22 AM	Start	Reporting	Session	None
February 2, 2021 9:53:31 AM	End	Reporting	Session	None
February 2, 2021 9:53:31 AM	Start	Qualification	Session	OQ
February 2, 2021 9:53:31 AM	Start	Execution	Tune EI - 5977B SQ: - Source: - None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	
February 2, 2021 9:53:55 AM	End	Execution	Tune EI - 5977B SQ: - Source: - EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
February 2, 2021 9:53:57 AM	Start	Execution	Tune EI - 5977B SQ: - Source: - None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
February 2, 2021 9:54:15 AM	End	Qualification	Session	OQ
February 2, 2021 9:54:15 AM	Start	Reporting	Session	None
February 2, 2021 10:04:03 AM	End	Reporting	Session	None

Page 4 / 5

Date: February 2, 2021 11:38:25 AM
 System ID: RYG_EN0136

User Name: eaknarin_puangsoa
 Hostname: ASRYGW7002

System Id: RYG_EN0136
 Print Date: February 2, 2021 11:38:27 AM

ALS_US1701M008 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
February 2, 2021 10:04:03 AM	Start	Qualification	Session	OQ
February 2, 2021 10:04:03 AM	Start	Execution	Tune EI - 5977B SQ: - Source: - None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
February 2, 2021 10:04:12 AM	End	Execution	Tune EI - 5977B SQ: - Source: - Run Count : 1 EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
February 2, 2021 10:04:14 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	None
February 2, 2021 10:10:00 AM	End	Qualification	Session	OQ
February 2, 2021 10:10:00 AM	Start	Reporting	Session	None
February 2, 2021 10:27:59 AM	End	Reporting	Session	None
February 2, 2021 10:27:59 AM	Start	Qualification	Session	OQ
February 2, 2021 10:27:59 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Extractor using Filament 1 - L: >= 1200	None
February 2, 2021 10:43:04 AM	End	Qualification	Session	OQ
February 2, 2021 10:43:04 AM	Start	Reporting	Session	None



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0020

MTC.No.23-65/0020

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL FLOWMETER

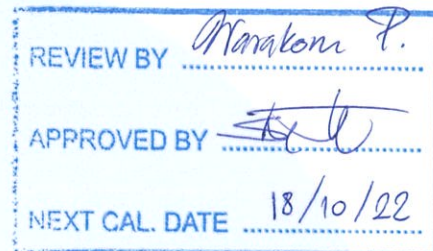
Manufacturer : BIOS International Corporation, USA.

Serial No.: 130026 (ID : BKK_FS0619)

Model : Defender 510-L

Scale range : 5 ml/min to 500 ml/min

Subdivision : (0.0001 , 0.001, 0.01) ml/min



Submitted by : ALS LABORATORY GROUP (THAILAND) CO., LTD.

104 Phatthanakan 40, Phatthanakan Rd.,

Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250, Thailand.

Received date : 8 October 2021

Condition of measured item : Normal

Calibration date : 18 October 2021

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 336/63	6-Apr-22	TISTR
Molbox/Pressure Transducer/UpStream	MP-0013-21	25-Jan-23	NIMT
Primary Flow Calibrator S/N 117982	MW-0011-21	8-Apr-23	NIMT

Calibrated by : *Terasak Panna*

(Mr.Terasak Panna)

Approved by : *[Signature]*

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013264100804158001

Issued Date 18 October 2021

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

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Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0020

2/2

MTC.No.23-65/0020

Calibration point : (20, 50, 100, 200, 400, 500) ml/min

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

Calibration method : The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

Measurement data :

UUC Value (ml/min)	Standard Value (ml/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
20.890	21.215	22.348	1008.78	-1.54	1.34
54.161	53.401	22.217	1008.81	+1.42	1.06
102.03	102.09	22.514	1008.83	-0.06	1.15
200.52	201.65	22.261	1008.86	-0.56	0.98
393.48	402.54	22.338	1009.08	-2.25	0.99
494.51	506.76	22.445	1009.22	-2.42	0.99

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k=2$, which provides a level of confidence of approximately 95%.

The end of calibration certificate.

Ts.

The results relate only to the items tested/calibrated or value assigned.

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FM.BL.MTC.002 Rev.4

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JIRANATEE ASSOCIATES CO.,LTD.

CALIBRATION REPORT

REVIEW BY Suchad T.

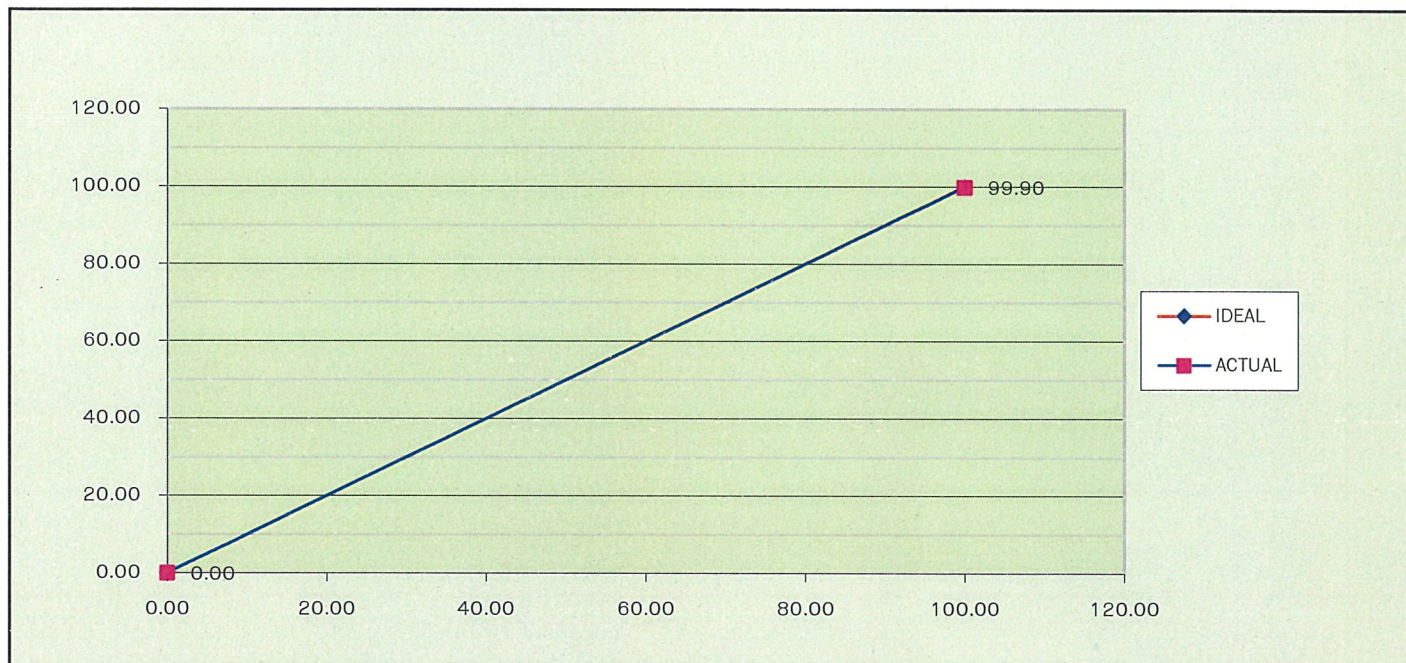
APPROVED BY Sararat M.

NEXT CAL. DATE 09/08/65

CUSTOMER NAME :	ALS Laboratory Group (Thailand) Co., Ltd.		
EQUIPMENT NAME :	Total Hydrocarbon Analyzer		
MANUFACTURER :	Baseline	MODEL :	9000 NMHC
STANDARD GAS CONCENTRATION (PPM) :	: 100 PPM (Methane)		SERIAL NO : 0314DR0170
CYLINDER PRESSURE (psig) :	800 PSI		CYLINDER NO : ND55981
CERTIFIED BY :	AIRGAS		CERTIFIED DATE : 12/02/2019
			EXPIRED DATE : 12/02/2021

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL	ACTUAL	ERROR	%ERROR
ZERO	0.00	0.00	0.00	-
1	100.00	99.90	-0.1	-0.10
AVERAGE (%)				0.02



CALIBRATED BY : จิรพล DATE : 9/2/64

CHECKED BY : จิรพล DATE : 9/2/64



ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 31 , E-Mail : Engineer@jiranatee.com

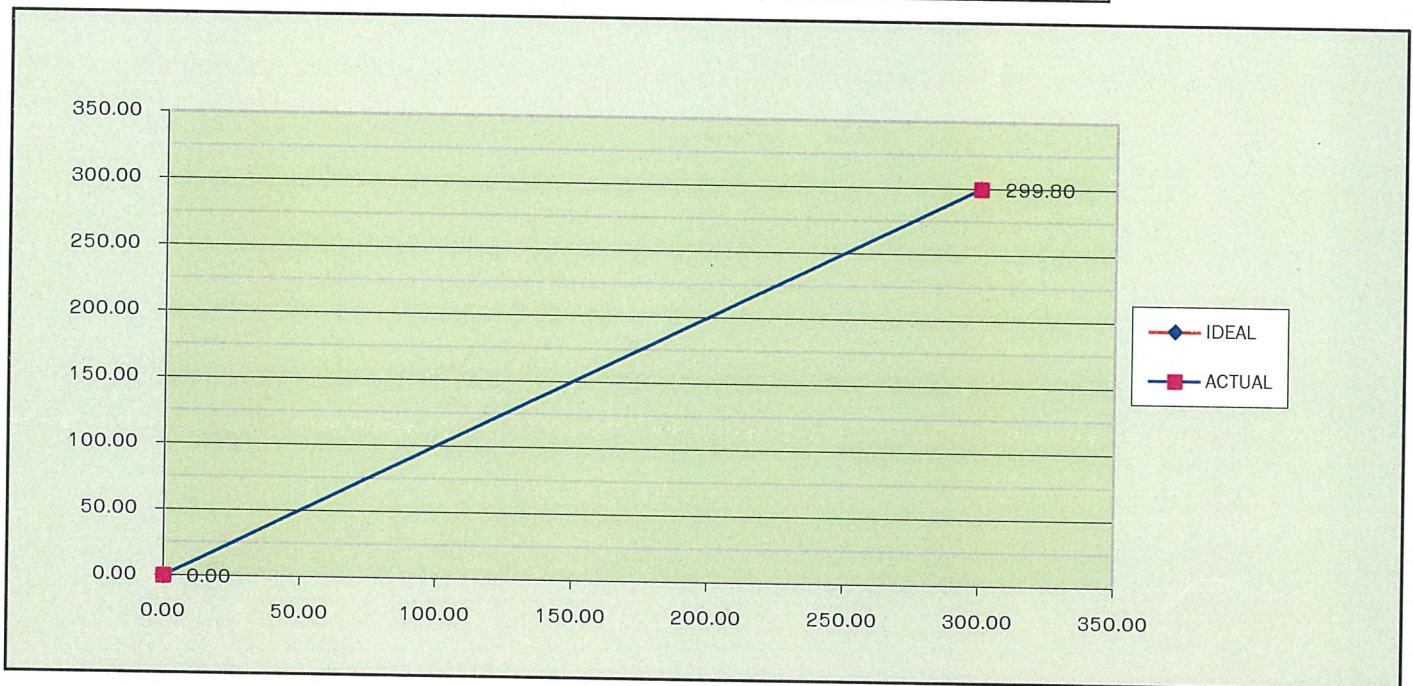
เลขที่ 63/14-15,67/35-36 ถนน เพชรเกษม 7,7/1 แขวง วัดท่าพระ เขต บางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02868-1889

CALIBRATION REPORT

CUSTOMER NAME : ALS Laboratory Group (Thailand) Co., Ltd.	
EQUIPMENT NAME : Total Hydrocarbon Analyzer	
MANUFACTURER : Baseline	MODEL : 9000 NMHC
STANDARD GAS CONCENTRATION (PPM) : 100 PPM (Propane)	
CYLINDER PRESSURE (psig) : 800 PSI	CYLINDER NO : ND55981
CERTIFIED BY : AIRGAS	CERTIFIED DATE : 12/02/2019
	EXPIRED DATE : 12/02/2021

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL	ACTUAL	ERROR	%ERROR
ZERO	0.00	0.00	0.00	-
1	300.00	299.80	-0.2	-0.07
AVERAGE (%)				0.02



CALIBRATED BY : โทพวธ DATE : 9/2/64

CHECKED BY : อ.ส. อ.ส. DATE : 9/2/64



ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 31 , E-Mail : Engineer@jiranatee.com
เลขที่ 63/14-15,67/35-36 ถนน เพชรเกษม 7,7/1 แขวง วัดท่าพระ เขต บางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02868-1889

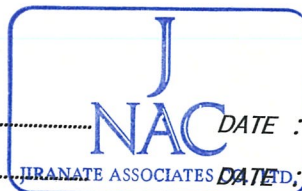
FLOW CALIBRATE

CUSTOMER NAME	: ALS Laboratory Group (Thailand) Co., Ltd.		
EQUIPMENT NAME	: Flow Calibrator		
MANUFACTURER	: Bios	MODEL : 510 L	SERIAL NO : 129549

Flow Parameter	Step	Set	Display	Flow Meter
Sample	Before	40	38	38 cc/min
	After	40	39	39 cc/min
Air	Before	175	160	160 cc/min
	After	175	175	175 cc/min
Fuel	Before	35	32	32 cc/min
	After	35	34	34 cc/min

CALIBRATED BY :

CHECKED BY :



DATE :

DATE :

9/2/64

9/2/64

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการหลังการขาย , โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jirantee.com
เลขที่ 63/14-15,67/35-36 ถนน เพชรเกษม 7,7/1 แขวง วัดท่าพระ เขต บางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02868-1886