

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	BKK_FS0789	5-Jan-26	5-Jul-26	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	BKK_FS0788	5-Jan-26	5-Jul-26	6
Ambient	Particulate Matter (PM ₁₀)	High Volume	BKK_FS0384	30-May-25	30-May-26	On site Calibration
Ambient	Particulate Matter (PM _{2.5})	Digital Balance	BKK_EN0003	30-May-25	30-May-26	12
Ambient	Total Suspended Particulate	High Volume	BKK_FS0371	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BKK_EN0003	30-May-25	30-May-26	12
Ambient	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Ambient	Total Hydrocarbon	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Ambient	Total Hydrocarbon	Air Sampling Pump	BKK_FS0338	26-Jun-26	26-Jun-26	3
Ambient	Total Hydrocarbon	Total Hydrocarbon Analyzer	BKK_FS1068	18-Jun-25	18-Jun-26	12
Ambient	Carbon Monoxide	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Ambient	Carbon Monoxide	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Ambient	Carbon Monoxide	Air Sampling Pump	BKK_FS0338	26-Jun-26	26-Jun-26	3
Ambient	Carbon Monoxide	CO Analyzer	BKK_EN0375	4-Aug-25	3-Aug-26	12
Water Lab	Lead	KC4MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Lead	Hot Block	BKK_EL0054	4-Aug-25	4-Sep-26	18
Water Lab	Lead	Chamber (Cooling Room)	BKK_EN0167	6-Jun-25	4-Dec-26	18
Water Lab	Cadmium	KC4MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Cadmium	Hot Block	BKK_EL0054	4-Aug-25	4-Sep-26	18
Water Lab	Cadmium	Chamber (Cooling Room)	BKK_EN0167	6-Jun-25	4-Dec-26	18
Water Lab	Mercury	Mercury Analyzer	BKK_EL0128	27-Aug-25	27-Aug-26	12
Water Lab	Total Coliform	Autoclave	BKK_NL0041	4-Aug-25	4-Sep-26	18
Water Lab	Total Coliform	Incubator	BKK_NL0231	21-Aug-25	21-Aug-26	12
Water Lab	Total Coliform	Hot Air Oven	BKK_NL0013	9-Oct-25	9-Apr-27	18
Water Lab	Fecal Coliform	Autoclave	BKK_NL0041	4-Aug-25	4-Sep-26	18
Water Lab	Fecal Coliform	Incubator	BKK_NL0231	21-Aug-25	21-Aug-26	12
Water Lab	Fecal Coliform	Hot Air Oven	BKK_NL0013	9-Oct-25	9-Apr-27	18
Water Lab	Fecal Coliform	Water Bath	BKK_NL0056	4-Feb-26	4-Feb-27	12
Water Lab	DO	DO Meter	BKK_EN0205	25-Jul-25	25-Jan-26	18
Water Lab	BOD	Incubator	BKK_EN0272	24-Dec-25	24-Dec-26	12
Water Lab	BOD	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	COD	Hot Block	BKK_EN0370	23-Dec-25	23-Dec-26	12
Water Lab	COD	Spectrophotometer	BKK_EN0356	8-Oct-25	8-Oct-26	12
Water Lab	Color	Chamber (Cooling Room)	BKK_EN0167	6-Jun-25	4-Dec-26	18
Water Lab	Conductivity	Conductivity meter	BKK_EN0373	30-Jun-25	30-Jun-26	12
Water Lab	Dissolved Oxygen (on site)	DO Meter	CHM_LG0002	19-Aug-25	19-Aug-26	12
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Oil & Grease	Water Bath	BKK_EN0439	9-Oct-25	9-Oct-26	12
Water Lab	pH at 25 °C	pH meter	BKK_EN0342	14-Oct-25	9-Oct-26	12
Water Lab	Phosphate	Discrete analyzer	BKK_EN0438	17-Jul-25	17-Jul-26	12
Water Lab	Settleable Solids	Chamber (Cooling Room)	BKK_EN0167	6-Jun-25	4-Dec-26	18
Water Lab	Sulfide	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	Sulfide	Chamber (Cooling Room)	BKK_EN0167	6-Jun-25	4-Dec-26	18
Water Lab	Temperature	DO Meter	CHM_LG0002	13-Aug-25	13-Aug-26	12
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0425	6-Oct-25	6-Oct-26	12
Water Lab	Total Kjeldahl Nitrogen	Digestion Unit	BKK_EN0366	24-Mar-26	24-Mar-27	12
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BKK_EN0358	15-Jul-25	15-Jul-26	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Total Suspended Solids	Oven	BKK_EN0425	6-Oct-25	6-Oct-26	12

1

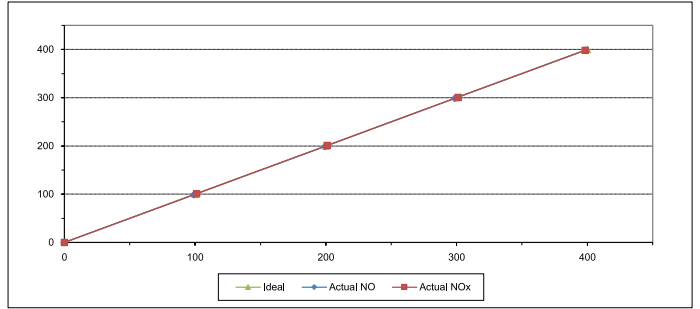
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MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	NOx Analyzer
Manufacturer	HORIBA	Model	APNA-370
Serial No.	R26E09EW	Equipment ID	BKK_FS0789
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	55.88	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00	101.10	1.10	1.10
2	200.00	199.30	-0.70	-0.35	201.10	1.10	0.55
3	300.00	298.60	-1.40	-0.47	301.10	1.10	0.37
4	400.00	398.60	-1.40	-0.35	398.40	-1.60	-0.40
AVERAGE (%)				-0.41			0.34



Calibrated By

Approved By

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

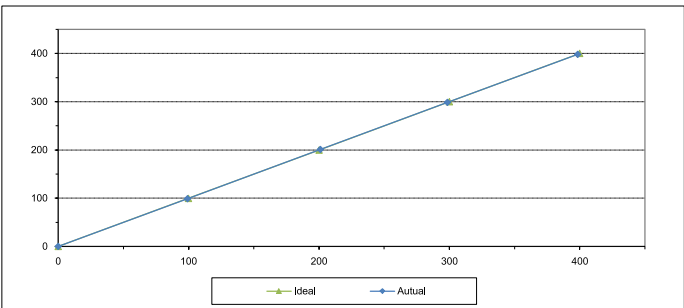
(Mr.Sarayuth Jitranont)
Assistant General Manager



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-26	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	PFDW4YU4	Equipment ID	BKK_FS0788
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	0.05	0.05	0.05
1	100.00	99.10	-0.90	-0.90
2	200.00	201.10	1.10	0.55
3	300.00	298.50	-1.50	-0.50
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.24



Calibrated By

Approved By

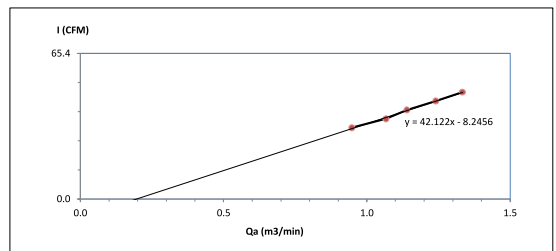
(Mr.Jirawat Sakam)
Field Environmental Scientist (3)

(Mr.Sarayuth Jitranont)
Assistant General Manager

High Volume Air Sampler Calibration Worksheet

Project Site :	Dcondo Ping Juristic Person Condominium	Barometric Pressure (mm Hg) :	730.4
Calibrate Location :	พื้นที่เก็บตัวอย่าง C	Temperature (°C) :	33.6
Calibrate Date :	7-Apr-26	High Volume ID :	BKK_FS0384
CalibrationSheet No.:	C-070426-BKK_FS0384	High Volume Model :	TE-5009X
Calibrator ID:	BKK_FS0624	High Volume S/N :	4788
Calibrator Model :	TE-5028A	Calibrator Slope :	1.03094
Calibrator S/N :	2584	Calibrator Intercept :	-0.01512

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.2	0.947	32	Slope : 42.1220
2	2.8	1.067	36	Intercept : -8.2456
3	3.2	1.139	40	Correlation Coefficient : 0.9979
4	3.8	1.240	44	
5	4.4	1.333	48	



Calibrated by

Approved by

(Mr.Keerati Taweerat)
BKK Field Services Scientist (1)

(Mr.Warakorn Pookrak)
Field Services Supervisor

Calibration certificate

Calibration Certificate No. 25BCI0197		
Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Ohaus	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	EX225D/AD	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial QM Ident. no.	C309774648 BKK_EN0403	This certificate relate and apply this equipment only.
Customer	ALS Laboratory Group (Thailand)Co., Ltd. 104 Phatthanakarn 40,Phattanakarn Rd.,Khwaeng Phatthanakarn ,Khet Suan Luang,Bangkok 10250	
Order no.	261969	REVIEW BY <i>Jude K</i> APPROVED BY <i>Sulok P</i> NEXT CAL DATE: 30/05/26
Number of pages	6	
Date of calibration	30 May 2025	

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date	30 May 2025	Approval of the Calibration Certificate	Person in charge
			
		Mr. Chonchai Inthana	Chonchai Inthana

Calibration certificate No.: 25BCI0197

Calibration Certificate

Range 1

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	30 May 2025
Temperature at place of calibration Temp. diff.	21.7 °C 0.5 K
Tweights - Tplace	
Measuring conditions	The installation site is suitable. The device was leveled. Balance was loaded up to Max before test.
Comments	Humidity 60.0 %RH.

Measurement results | Measurement uncertainties

Repeatability		
Test load (nominal): 1 g 100 g		
	1 g	100 g
1	0,99993 g	99,99971 g
2	0,99991 g	99,99971 g
3	0,99992 g	99,99974 g
4	0,99993 g	99,99973 g
5	0,99992 g	99,99974 g
6	0,99991 g	99,99970 g
7	0,99993 g	99,99973 g
8	0,99994 g	99,99972 g
9	0,99995 g	99,99971 g
10	0,99995 g	99,99969 g
s = 0,000014 g		s = 0,000017 g

Eccentricity	
Test load (nominal): 50 g	
Center	49,99996 g
Front left	49,99993 g
Back left	49,99993 g
Back right	49,99994 g
Front right	49,99990 g
Maximum deviation from centric loading indication	
Δf _{ecc} max = 0,00006 g	

Error of indication					
Testload L	Indication I	Error E	Expansion factor k	Uncertainty U(E)	Uncertainty relative U _{rel} (E)
0,00000 g	0,00000 g	0,00000 g	2,00	0,000030 g	---
0,01000 g	0,00995 g	-0,00005 g	2,00	0,000037 g	0,37 %
0,10000 g	0,09991 g	-0,00009 g	2,00	0,000038 g	0,038 %
0,50000 g	0,49985 g	-0,00015 g	2,00	0,000040 g	0,0080 %
1,00000 g	0,99991 g	-0,00009 g	2,00	0,000041 g	0,0041 %
5,00002 g	4,99997 g	-0,00005 g	2,00	0,000050 g	0,0010 %
10,00002 g	10,00003 g	0,00001 g	2,00	0,000069 g	0,00069 %
50,00002 g	49,99972 g	-0,00030 g	2,00	0,000091 g	0,00018 %
70,00004 g	69,99975 g	-0,00029 g	2,00	0,00017 g	0,00024 %
100,00001 g	99,99958 g	-0,00043 g	2,00	0,00017 g	0,00017 %
115,00006 g	114,99966 g	-0,00040 g	2,00	0,00028 g	0,00024 %
Maximum error of indication		E _{max} = 0,00043 g			

U_{rel}(E) is the quotient of U(E) and test load L. The uncertainty of measurement U(E) is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.

Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Calibration certificate No.: 25BCI0197	
Calibration Certificate	
Calibration object	
Multi range instrument	
Model	EX225D/AD
Serial Number	C309774648
QM Ident. no Inventory no.	BKK_EN0403 —
Range	12
Maximum capacity (Max. load)	120,00000 g220,0000 g
Measured range	120,00000 g220,0000 g
Scale interval	0,00001 g0,0001 g
Place of calibration	
Address	According to page 1
Department Cost center	Environment Department. —
Building Floor	--- 1st Floor.
Room	Laboratory Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	Testo 174(Traceable to Si unit through ENTECH)	11 Nov 2025
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	23 Aug 2025

Calibration certificate No.: 25BCI0197

Calibration Certificate

Range 2

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	30 May 2025
Temperature at place of calibration Temp. diff.	21.7 °C 0.5 K
Tweights - Tplace	
Measuring conditions	The installation site is suitable. The device was leveled. Balance was loaded up to Max before test.
Comments	Humidity 60.0 %RH.

Measurement results | Measurement uncertainties

Repeatability		Eccentricity	
Test load (nominal): 200 g		Test load (nominal): 100 g	
200 g		Center	99,99984
1	199,9998 g	Front left	99,99990
2	199,9998 g	Back left	99,99983
3	199,9998 g	Back right	99,99979
4	200,0000 g	Front right	99,99979
5	199,9998 g	Maximum deviation from centric loading indication	
6	199,9999 g	Δf _{ecc} max = 0,00006 g	
7	199,9999 g		
8	200,0000 g		
9	199,9998 g		
10	199,9999 g		
s = 0,00008 g			

Error of indication					
Testload L	Indication I	Error E	Expansion factor k	Uncertainty U(E)	Uncertainty relative U _{rel} (E)
0,00000 g	0,00000 g	0,00000 g	2,00	0,000030 g	---
20,00002 g	19,99986 g	-0,00016 g	2,00	0,000069 g	0,00034 %
50,00002 g	49,99978 g	-0,00024 g	2,00	0,000091 g	0,00018 %
70,00004 g	69,99981 g	-0,00023 g	2,00	0,00017 g	0,00024 %
90,00007 g	89,99976 g	-0,00031 g	2,00	0,00018 g	0,00020 %
110,00003 g	109,99986 g	-0,00017 g	2,00	0,00028 g	0,00025 %
130,00011 g	129,9999 g	-0,0002 g	2,00	0,00028 g	0,00022 %
150,0000 g	149,9999 g	-0,0001 g	2,00	0,00028 g	0,00019 %
170,0000 g	170,0000 g	0,0000 g	2,00	0,00028 g	0,00016 %
200,0000 g	199,9998 g	-0,0002 g	2,00	0,00028 g	0,00014 %
220,0000 g	219,9999 g	-0,0001 g	2,00	0,00029 g	0,00013 %
Maximum error of indication		E _{max} = 0,0003 g			

U_{rel}(E) is the quotient of U(E) and test load L. The uncertainty of measurement U(E) is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.

Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

Uncertainty of measurement in use

Range 1

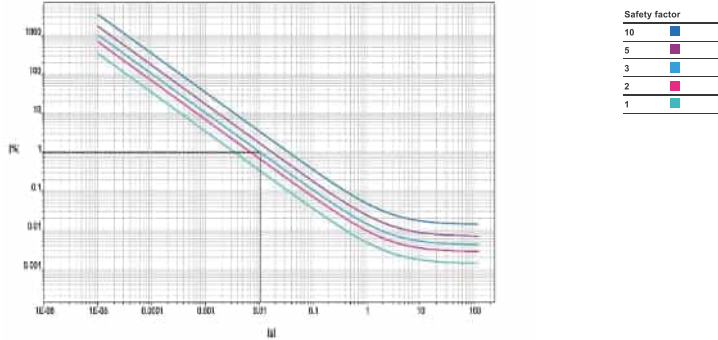
Device adjusted before measurement	Yes
Temperature deviation considered	5 K
Temperature coefficient considered	$2 \cdot 10^{-4}/K$

Uncertainty of the weighing result $U_{gI}(W)$ $U_{gI}(W) = 0.000035\text{ g} + 1.38 \cdot 10^{-5} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{gI}(W)$	Uncertainty relative $U_{gI}(W)_{rel}$
1 %	1,20000 g	0,000052 g	0,0043 %
25 %	30,00000 g	0,00045 g	0,0015 %
50 %	60,00000 g	0,00086 g	0,0014 %
75 %	90,00000 g	0,0013 g	0,0014 %
100 %	120,00000 g	0,0017 g	0,0014 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.01045 g

Uncertainty of measurement in use

Range 2

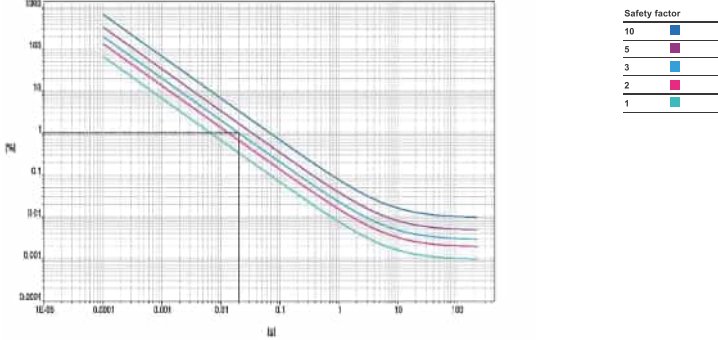
Device adjusted before measurement	Yes
Temperature deviation considered	5 K
Temperature coefficient considered	$2 \cdot 10^{-4}/K$

Uncertainty of the weighing result $U_{gI}(W)$ $U_{gI}(W) = 0.000067\text{ g} + 9.52 \cdot 10^{-6} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{gI}(W)$	Uncertainty relative $U_{gI}(W)_{rel}$
1 %	2,20000 g	0,000088 g	0,0040 %
25 %	55,00000 g	0,00059 g	0,0011 %
50 %	110,00000 g	0,0011 g	0,0010 %
75 %	165,00000 g	0,0016 g	0,00099 %
100 %	220,00000 g	0,0022 g	0,00098 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

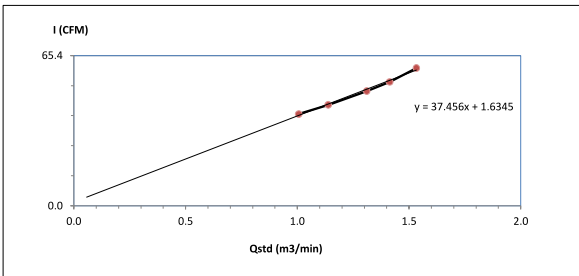
Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.02019 g



High Volume Air Sampler Calibration Worksheet

Project Site :	Dcondo Ping Juristic Person Condominium	Barometric Pressure (mm Hg) :	730,4
Calibrate Location :	บนดาดฟ้าอาคาร C	Temperature (°C) :	33,6
Calibrate Date :	7-Apr-26	High Volume ID :	BKK_FS0371
CalibrationSheet No.:	C-070426-BKK_FS0371	High Volume Model :	G1051
Calibrator ID:	BKK_FS0624	High Volume S/N :	1324
Calibrator Model :	TE-5028A	Calibrator Slope :	1,64598
Calibrator S/N :	2584	Calibrator Intercept :	-0,02439

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.8	1.0069	40	Slope : 37,4555
2	3.6	1.1385	44	Intercept : 1,6345
3	4.8	1.3108	50	Correlation Coefficient : 0,9954
4	5.6	1.4139	54	
5	6.6	1.5329	60	



Calibrated by

K Taveerat
(Mr. Keerati Taweerat)
BKK Field Services Scientist (1)

Approved by :

Warakorn P.
(Mr. Warakorn Pookrak)
Field Services Supervisor

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
5139 MOO 13, SOI BUNTINAKORN 11 TAMBON BANG KAO,
AMPHOE DANG PHU SAMUT PRAKAN PROVINCE 10140 (THAILAND)
TEL : (0660-2116-5800) FAX: (0660-2116-7140)



Certificate of Calibration

Customer	Name : ALS Laboratory Group Thailand Co., Ltd.	Certificate No : 25-AFM-208
Address	104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250	Request No : Req2025-1986
Unit Under Calibration Details	Measurement Item : Air Flow Meter Manufacturer : Mesa Labm Model : 200-310M Serial Number : 151114 ID# : BKK_FS0614 Location of Calibration : LAB 4 AIR FLOW METER	Sensor Model : - Sensor Serial Number : - Instrument Status : Used
Calibration Environment and Details	Temperature : 23 °C ± 3 °C Humidity : 55 %RH ± 20 %RH Barometric Pressure : 1013 hPa ± 10 hPa Received Date : 3 September 2025 Calibration Date : 10 September 2025	REVIEW BY : <i>Warakorn P.</i> APPROVED BY : <i>K Taveerat</i> NEXT CAL DATE : 09/09/26
Calibration Procedure	In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator	

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Scmidlyne	5 May 2026
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Scmidlyne	6 May 2026
Temperature meter	GT 11	08000057	Qesborn	15 October 2025
Pressure meter	CPC2400	41000KDI1631082	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Scmidlyne AZLA Accreditation No. 3913.01 and MET NSC-TIS1-TIS Accreditation No. 0052

Note :

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

Calibration By :

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Mr. Paet Mahavorn
Calibration Engineer Supervisor

Issue Date :

10 September 2025

Certificate No : 25-AFM-207
Request No : Req-2025-1986

Result of Calibration : Without Adjustment

STD Reading			UUC Reading			Error (cc/min)	Uncertainty		
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)		(cc/min)	(°C)	(kPa)
25.5	100.98	100	-	-	100.02	0.0	3.6	1.0	0.50
25.7	100.97	503	-	-	500.81	-2.2	9.5	1.0	0.50
25.8	100.89	1003	-	-	1009.1	-3	19	1.0	0.50
26.1	100.88	2000	-	-	2001.9	2	38	1.0	0.50
26.5	100.85	3014	-	-	3002.2	-12	57	1.0	0.50
26.7	100.81	4027	-	-	4008.9	-26	76	1.0	0.50
27.0	100.74	5048	-	-	5001.8	-46	95	1.0	0.50

Note STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition, Air □
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

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

FM-708-AFM-01 Rev.05 Issue date 21/2/25

Certificate No : 25-AFM-207
Request No : Req-2025-1987

Result of Calibration : Without Adjustment

STD Reading			UUC Reading			Error (cc/min)	Uncertainty		
Temperature (°C)	Pressure (kPa)	Flow (cc/min)	Temperature (°C)	Pressure (kPa)	Flow (cc/min)		(cc/min)	(°C)	(kPa)
25.5	100.89	25	-	-	25.042	0.0	1.6	1.0	0.50
25.8	100.90	50	-	-	49.921	-0.1	8.0	1.0	0.50
25.5	100.91	100	-	-	100.09	0.1	3.6	1.0	0.50
25.4	100.80	150	-	-	150.34	0.3	5.4	1.0	0.50
25.6	100.91	199	-	-	200.17	1.2	7.2	1.0	0.50
25.6	100.95	301	-	-	300.05	-1	11	1.0	0.50
25.7	100.90	402	-	-	401.03	-1	14	1.0	0.50
25.7	100.95	503	-	-	500.28	-3	19	1.0	0.50

Note STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition, Air □
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

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

FM-708-AFM-01 Rev.06 Issue date 21/2/25

Certificate of Calibration

Certificate No : 25-AFM-207
Request No : Req-2025-1987

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

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Mesa Labs
Model : 200-510L
Serial Number : 130026
ID : BKK_F50619
Location of Calibration : LAD 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 1 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 3 September 2025
Calibration Date : 10 September 2025
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 3 Low flow	1851010006	Sensidyne	5 May 2026
Air Flow Meter	Calibrator 3 Standard flow	18031011003	Sensidyne	6 May 2026
Temperature meter	GT 11	08000057	Quborn	15 October 2025
Pressure meter	CPQ2400	41090KDJ651002	IPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2L Accreditation No. 0943.01 and MET NSC-TIS-TIS Accreditation No. 0052

Note :

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

Calibration By : 
Mr. Noppakorn Luangrui
Service Calibration Engineer

Approved By : 
Mr. Pait Muthakorn
Calibration Engineer Supervisor
Issue Date : 10 September 2025

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

FM-708-AFM-01 Rev.06 Issue date 21/2/25

Certificate of Calibration

Certificate No. : C-260326-BKK_F50338

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gillan
Model/Type : G6Air Plus
Equipment ID : BKK_F50338
Serial No. : 20150910090
Calibration Date : 26-Mar-26
Next calibration date : 26-Jun-26

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : BKK_F50619
Serial No. : 130026
Calibration Date : 10-Sep-25
Due Date : 09-Sep-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_F50614
Serial No. : 151114
Calibration Date : 10-Sep-25
Due Date : 09-Sep-26

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	10.7	10.2	10.2	10.4	5%	19 - 21	Passed
50	52.2	51.5	51.3	51.7	5%	48 - 53	Passed
100	100.5	100.7	100.8	100.7	5%	95 - 105	Passed
200	200.1	198.5	199.2	199.3	5%	190 - 210	Passed
High Flow							
500	501.7	501.8	501.4	501.6	3%	485 - 515	Passed
1000	994.4	995.2	992.9	994.2	3%	970 - 1030	Passed
2000	1998.9	1996.8	2002.4	1999.4	3%	1940 - 2060	Passed
2500	2501.8	2504.6	2500.9	2502.4	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By : 
(Mr. Pitsanong Chaiya)
BKK Field Services Scientist (1)

Approved By : 
(Mr. Warakorn Pookrak)
Field Services Supervisor

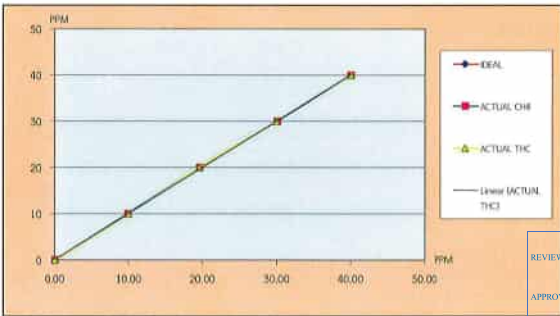
Issue date : 27-Mar-26

TEST REPORT

CUSTOMER NAME	ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอส กรุ๊ป (ประเทศไทย) จำกัด)						
EQUIPMENT NAME	THC Analyzer						
MANUFACTURER	HORIBA	MODEL	APIA-370	SERIAL NO.	WUC09M		
STANDARD GAS CONCENTRATION (PPM) (CH4)	506.1 PPM			CYLINDER NO.	CC734373		
CYLINDER PRESSURE (psig)	1,600 PSI			CERTIFIED DATE	12/05/2020		
CERTIFIED BY	AIRGAS			EXPIRED DATE	12/05/2028		

TEST RESULTS

POINT NO	TEST RESULTS						
	IDEAL	ACTUAL CH4	ERROR CH4	ERROR CH4	ACTUAL THC	ERROR THC	ERROR THC
ZERO	0.00	0.00	0.00	-	0.00	0.00	-
1	10.00	9.81	-0.19	-1.90	9.95	-0.05	-0.50
2	20.00	19.60	-0.40	-2.00	19.58	-0.42	-2.10
3	30.00	30.03	0.03	0.10	29.91	-0.09	-0.30
4	40.00	40.00	0.00	0.00	40.00	0.00	0.00
AVERAGE (%)				-0.95		-0.73	



CALIBRATED BY: *[Signature]* DATE: 18/6/19
CHECKED BY: *[Signature]* DATE: 18/6/18

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : กรุณาติดต่อฝ่ายบริการลูกค้า โทร 02-868-0812 # 15,16, E-Mail: Engineer@jranatee.com
เลขที่ 63/14-15,67/35-36 ถนนเพชรเกษม 7/71 แขวงวัดบางพลีใหญ่ เขตภาษีเจริญ กรุงเทพมหานคร 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

FO-EN-206 R01/22-10-14

CHECK LIST

CUSTOMER NAME	ALS Laboratory Group (Thailand) Co., Ltd. (บริษัท แอลเอส กรุ๊ป (ประเทศไทย) จำกัด)		
EQUIPMENT NAME	THC Analyzer		
MANUFACTURER	HORIBA	MODEL	APIA-370
SERIAL NO.	WUC09M		

TEST VALUES				
NO.	THC Analyzer (APIA - 370)	UNIT	BEFORE	AFTER
1	Signal (CH4)	mV	1.10	27.50
2	Signal (THC)	mV	0.00	31.60
3	Detector	Temp °C, Standard Value : Ambient temp(5°C to 15°C) Pressure kPa, Standard Value : (Ambient/1013x100-200)±4kPa	30.40	48.10
4	Ambient	kPa current atmospheric pressure	101.70	101.60
5	Purifier	°C, Standard Value : 390 °C to 430 °C	30.30	418.70
6	NMHC	kPa, Normal value : 8 kPa to 25 kPa	7.20	7.20
7	OC 24 V	°C, Standard Value : 230 °C to 260 °C	30.10	244.20
8	OC 5 V	V, Standard Value : 24 V ± 0.5 V	24.90	24.90
9	Bypass (Optional)	V, Standard Value : 5 V ± 0.5 V	4.90	4.90
10	Over Flow (Optional)	L/min, Normal value : 0.9 L/min ± 0.3 L/min	-	-
11	CH4 Sampling Reading	L/min, Standard Value : 0.8 L/min or More	-	-
12	NMHC Sampling Reading	PPM	1.33	1.95
13	THC Sampling Reading	PPM	0.32	0.10
14	Zero Gas CH4/THC	PPM	1.64	2.95
15	Span Gas	PPM	-0.71/0.88	0.0/0.0
16	Span Gas	PPM	41.71/81.89	40.0/40.0
17	G Gas H2	20 PSI	20	20

Remark: Reference: EX-EN-017-56, Ambient HC Monitor APIA-370 Operation Manual Page #B1
Remark: (Ambient temperature = 5°C to 40°C)

รายการตรวจสอบ

- Service Maintenance

รายละเอียดการดำเนินการ

- บริการ Service Maintenance , ทำ Calibration Zero/Span, Multipoint

ผลการดำเนินการ

- เชิญรับ เครื่องสามารถดำเนินการตรวจวัดได้ตามปกติ

CALIBRATED BY: *[Signature]* DATE: 18/6/19
CHECKED BY: *[Signature]* DATE: 18/6/18

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : กรุณาติดต่อฝ่ายบริการลูกค้า โทร 02-868-0812 # 15-16, E-Mail: Engineer@jranatee.com
เลขที่ 63/14-15,67/35-36 ถนนเพชรเกษม 7/71 แขวงวัดบางพลีใหญ่ เขตภาษีเจริญ กรุงเทพมหานคร 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889

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

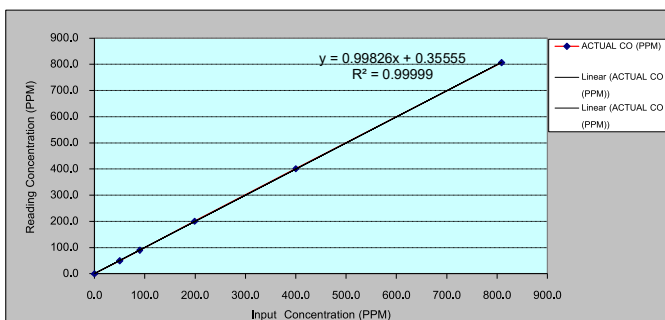
MULTI POINT CALIBRATION REPORT

CUSTOMER NAME	ALS Laboratory Group (Thailand) Co.Ltd.		
EQUIPMENT NAME	CO Analyzer		
MANUFACTURER	Teledyne - API	MODEL	T300
STANDARD GAS CONCENTRATION (PPM)	808.9	SERIAL NO.	5947
CYLINDER PRESSURE (psig)	900	CERTIFIED DATE	CC739972
CERTIFIED BY	AIRGAS SPECIALTY GASES	CERTIFIED DATE	Nov .05 .2020
		EXPIRED DATE	Nov .05, 2028

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.010	0.010	-
1	50.00	49.541	-0.459	-0.918
2	90.00	89.472	-0.528	-0.587
3	199.20	200.522	1.322	0.664
4	400.30	401.311	1.011	0.253
5	808.90	806.978	-1.922	-0.238
AVERAGE (%)				0.523

REVIEW BY: *Prasanna P.*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 03/08/26



CALIBRATED BY: คุณอนันต์ มหาวาจา DATE: 4 สิงหาคม 2568

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : กรุณาติดต่อฝ่ายบริการลูกค้า โทร 02-515-8987

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

Agilent Technologies

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988 RAMA 4 ROAD, SILOM, BANGRAK
Bangkok 10500 Thailand

Tel: +662 637 6363
Fax: +662 632 4334
Email: oco-sm@agilent.com
Website: www.agilent.com/chem

BKK_EL0043

Customer Contact:

ALS Laboratory Group (Thailand) Co Ltd Head Office
104 Phatthanakan 40 Phatthanakan Rd
Khaeng Phatthanakan Khet Suan
TAX ID : 0105540004859
Chanattagarn.lmchom@alsglobal.com
27603068

Invoice To:

ALS Laboratory Group (Thailand) Co Ltd Head Office
104 Phatthanakan 40 Phatthanakan Rd
Khaeng Phatthanakan Khet Suan

Delivery Site:

ALS Laboratory Group (Thailand) Co Ltd Head Office
104 Phatthanakan 40 Phatthanakan Rd
Khaeng Phatthanakan Khet Suan

Location:
Room
Bldg
Lab
Dept

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70371013
Service Request:	Service Request Date:
Service Order: 6007607368	Service Confirmation: 6906615981

Direct Inquiries to:

Contact Name: Customer Contact Center
Contact E-mail: oco-sm@agilent.com
Contact Telephone: +662 637 6363
Contact Fax: +662 632 4334

REVIEW BY: *Andree K.*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 08/10/2026

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Acc. No: 012-4452-007
THB/Krung Thai Bank PCL
Siam Square Br.416/1-2 Rama I Rd., Pathumwan, BKK 10330 Thailand

ORIGINAL

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7900	ICPMS 7900 System			
G8410A	SPS 4 Autosampler	AU15430722	ICP MS 7900	SYS-IM-7900
G8411A	ISIS 3 for Agilent 7850/7900/8900	JP15510227	ICP MS 7900	SYS-IM-7900
G3292A	PSC 6106T Chiller	2U15A1948	ICP MS 7900	SYS-IM-7900
G8403A	Agilent 7900 ICP-MS	JP15471169	ICP MS 7900	SYS-IM-7900

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EOQ	Enterprise Operational Qualification	1.00	Agreement Entitlement - 100 % covered	03.10.2025	03.10.2025
1010	5185-5850	ICP-MS Checkout Solutions	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Service Information:

Problem Description: *WU-EQO-IM-7900-5001413366		
Service Provided: Perform OQ hardware control. Test logon , tune , BG and stability. Test OQ control of instrument ICPMS=BKK_EL0043 After done the instrument test all pass.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 5.0	Travel Hours: 1.5	
Customer Field Service Representative Name: Panthev Kurasathain	Customer Field Service Representative Signature: 	Date: 03 Oct 2025
Customer Name: Anchalae Khamjan	Customer Signature: Anchalae K.	Date: 03 Oct 2025
Additional Comments:		



Metrological Center
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhohi, Saraburi 18110
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T250355

Page 1 of 6

Certificate of Calibration

Equipment : HEATING BLOCK
Manufacturer : Environmental Express
Model : SC 196
Serial No. : 6974CECW3285
Customer Code : BKK_EL0054
ID No. : T5306A3
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250
Customer Location : Acid Digestion Lab
Date of Receipt : 26 February 2025
Calibrated By : Atiphong Rongrat (Technician)
Approved By :  / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 7 MAR 2025

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.



Metrological Center
SCI ECO Services Company Limited
33/2 Moo 3, T.Banpa, A.Kaengkhohi, Saraburi 18110
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T250355

Page 2 of 6

Calibration Report

Equipment : HEATING BLOCK
Date of Calibration : 4 March 2025
Environment : Temperature : 24.4-24.9 °C
Line Voltage : 221.6-226.3 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

- This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN221-TN230	T240712	19 April 2025
TC	TYPE T	TN231-TN240	T240712	19 April 2025
TC	TYPE T	TN241-TN250	T240401	16 March 2025
TC	TYPE T	TN251-TN260	T240401	16 March 2025
DATA LOGGER	34970A	T193	T240401	16 March 2025

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 2 Hour 40 Minute At 95 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

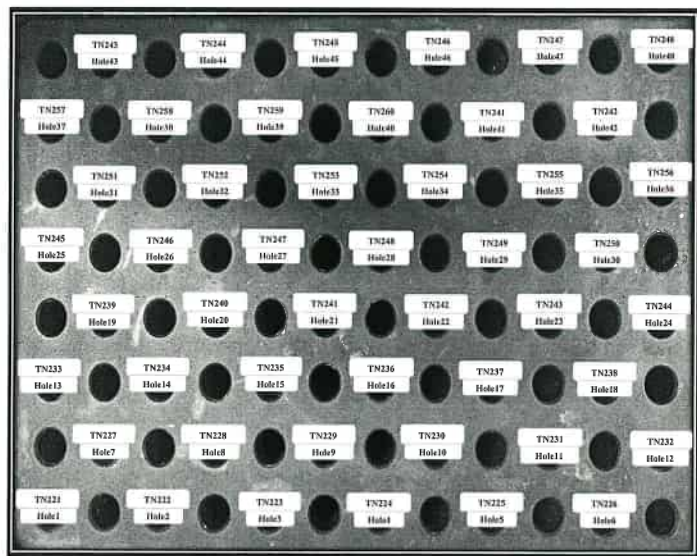
5. Adjustment :

() without adjustment

(X) after adjustment

Approved By: 

Calibration Report



FRONT CONTROL

 Approved By: 

FM-L13 108/30-05-57

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	94.85	95.37	95.03	95.25	94.75
	Min	94.17	94.66	94.38	94.63	94.87
	Average	94.51	95.02	94.70	94.94	95.20
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	94.71	94.56	94.79	95.32	95.44
	Min	94.05	93.88	94.10	94.65	94.90
	Average	94.38	94.22	94.44	94.99	95.17
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	95.26	95.43	95.40	95.71	95.41
	Min	94.54	94.64	94.71	95.10	94.86
	Average	94.90	95.03	95.06	95.41	95.13
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	95.13	95.06	95.68	96.16	95.35
	Min	94.39	94.43	94.86	95.51	94.88
	Average	94.76	94.75	95.27	95.83	95.12
R5 Hole25-Hole30	TN245	TN246	TN247	TN248	TN249	TN250
	Max	94.95	95.81	95.39	95.82	95.66
	Min	94.47	95.03	94.67	94.99	94.84
	Average	94.71	95.42	95.03	95.41	95.25
R6 Hole31-Hole36	TN251	TN252	TN253	TN254	TN255	TN256
	Max	96.07	95.34	96.28	95.39	94.95
	Min	95.28	94.55	95.51	94.62	94.13
	Average	95.67	94.95	95.90	95.00	94.54
R7 Hole37-Hole42	TN257	TN258	TN259	TN260	TN241	TN242
	Max	95.15	95.63	96.11	95.09	95.34
	Min	94.38	94.88	95.32	94.28	94.54
	Average	94.76	95.25	95.71	94.69	94.94
R8 Hole43-Hole48	TN243	TN244	TN245	TN246	TN247	TN248
	Max	95.84	95.87	95.44	95.72	95.65
	Min	95.06	95.10	94.60	94.95	94.87
	Average	95.45	95.48	95.02	95.34	95.26

 Approved By: 

FM-L13 108/30-05-57

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	104.48	104.40	104.60	105.27	105.24
	Min	104.15	104.02	104.25	104.94	104.91
	Average	104.32	104.21	104.42	105.10	105.08
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	105.20	105.45	105.58	105.96	105.81
	Min	104.92	105.14	105.29	105.64	105.53
	Average	105.06	105.29	105.43	105.80	105.67
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	106.09	106.14	105.83	106.25	105.97
	Min	105.80	105.89	105.57	106.00	105.69
	Average	105.94	106.01	105.70	106.13	105.83
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	105.87	105.75	105.30	105.07	105.22
	Min	105.62	105.52	105.13	104.90	105.05
	Average	105.74	105.63	105.21	104.98	105.14
R5 Hole25-Hole30	TN245	TN246	TN247	TN248	TN249	TN250
	Max	105.62	105.54	105.52	105.75	105.97
	Min	105.45	105.35	105.31	105.37	105.81
	Average	105.53	105.44	105.41	105.66	105.89
R6 Hole31-Hole36	TN251	TN252	TN253	TN254	TN255	TN256
	Max	106.19	106.34	106.47	105.96	105.76
	Min	106.02	106.16	106.31	105.77	105.58
	Average	106.10	106.25	106.39	105.87	105.67
R7 Hole37-Hole42	TN257	TN258	TN259	TN260	TN241	TN242
	Max	106.21	105.59	105.45	105.36	106.08
	Min	106.04	105.42	105.28	105.20	105.90
	Average	106.12	105.51	105.37	105.28	105.99
R8 Hole43-Hole48	TN243	TN244	TN245	TN246	TN247	TN248
	Max	106.54	106.33	105.78	105.38	105.42
	Min	106.38	106.16	105.60	105.20	105.25
	Average	106.46	106.25	105.69	105.29	105.33

 Approved By: 

FM-L13 108/30-05-57

Calibration Report

Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (± °C)	Uncertainty (± °C)
	Min	Average		
102.0	-	102.0	0.43	0.83
107.0	-	107.0	0.20	0.70

* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

 Approved By: 

FM-L13 108/30-05-57

Certificate No. T250873

Certificate of Calibration

Page 1 of 4

Equipment : Chamber (Cooling Room)
Manufacturer : KOLDTECH
Model : KM 320
Serial No. : TBN-1012061/05
Customer Code : BKK_EN0167
ID No. : T2463A3
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Laboratory Room
Date of Receipt : 28 May 2025
Calibrated By : Atiphong Rongrat (Technician)
Approved By : [Signature] / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 19 JUN 2025

REVIEW BY [Signature]
APPROVED BY [Signature]
NEXT CAL DATE 04/12/26

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-TL06 102/27-03-68

Certificate No. T250873

Calibration Report

Page 2 of 4

Equipment : Chamber (Cooling Room)
Date of Calibration : 4 June 2025
Environment : Temperature : 23.4-24.9 °C
Line Voltage : 221.4-230.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

- This equipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986) . All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN91-TN100	T242036	3 December 2025
TC	TYPE T	TN101-TN110	T242036	3 December 2025
DATA LOGGER	34970A	T121	T242036	3 December 2025
- This certificate is traceable to : National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244) .
- Condition of calibrated item : good.
Equipment Description :
Time Constant 2 Hour 20 Minute At 3 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment :
(X) without adjustment () after adjustment

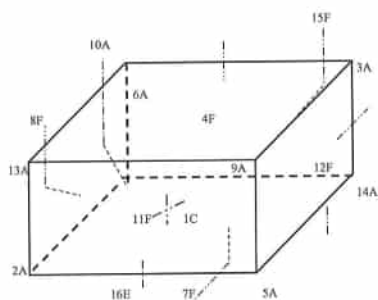
Approved By. [Signature]

FM-TL07 102/27-03-68

Certificate No. T250873

Calibration Report

Page 3 of 4



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C = TN91	12F = TN102
2A = TN92	13A = TN103
3A = TN93	14A = TN104
4F = TN94	15F = TN105
5A = TN95	16E = TN106
6A = TN96	
7F = TN97	
8F = TN98	
9A = TN99	
10A = TN100	
11F = TN101	

Approved By. [Signature]

FM-TL07 102/27-03-68

Certificate No. T250873

Calibration Report

Page 4 of 4

Measurement Results

Average Standard Reading at each position (°C)											
Calibration Point	TN91	TN92	TN93	TN94	TN95	TN96	TN97	TN98	TN99	TN100	TN101
3.0	2.95	2.92	3.09	2.92	3.16	3.50	3.40	3.03	3.14	2.98	3.44
	TN103	TN104	TN105	TN106							
	3.19	3.06	3.46	2.92							

Chamber (Cooling Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min , Max	Average					
3.0	2.8 , 3.9	3.4	3.14	1.20	1.30	1.90	2.04

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By. [Signature]

FM-TL07 102/27-03-68

Performance Verification Certificate for Mercury Analyzer

PRODUCT ID : **Quicktrace M-8000 , Teledyne Leeman Labs**

Equipment ID : **BKK_EL0128 Mercury Analyzer**
S/N: US22133002

BKK_EL0129 Autosampler
S/N: 052222A560

Customer Name : **ALS Laboratory Group (Thailand) Co., Ltd.**
Address : **104 Soi Pattana 40, Pattana Rd. Suan Luang, Suan Luang Bangkok 10250 Thailand**

Date of Qualified : **November 27, 2025**
Next Due date : **November 27, 2026**

This certifies for products which was performed in acceptable criteria specifications

Autosampler & Sample Introduction Analyzer	PASSED
Gas Liquid Separator & Dryer	PASSED
CVAFS Detector	PASSED
Electronics/Mechanical	PASSED
Data station/PC	PASSED
Analytical test	PASSED

Provided by

Scientist Instrument Co., Ltd.
113 Soi Ekachai 44, Ekachai Road
Khlong Bang Phran, Bangbon
Bangkok 10150 Thailand

Certified by Thunraphol Sakdayos
Service Engineer

Certificate No. T250353

Page 1 of 4

Certificate of Calibration

Equipment : **Autoclave**

Manufacturer : **TOMY**

Model : **SX-700**

Serial No. : **48134190**

Customer Code : **BKK_ML0041**

ID No. : **T7725A3**

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

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

Customer Location : **Washing Room**

Date of Receipt : **26 February 2025**

Calibrated By : **Boonchai Suriyawong (Site Calibration Manager)**

Approved By : Sujar Naknakred / **Sujar Naknakred (Site Calibration Manager)**

Date of Issue : **10 Mar 2025**

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

FM-L14 11/18-08-66

Certificate No. T250353

Page 2 of 4

Calibration Report

Equipment : **Autoclave**
Date of Calibration : **4 March 2025**
Environment : **Temperature : 22.2-25.4 °C**
Line Voltage : 221.1-224.7 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 3 standard temperature recorder into its chamber and test according to WI-T23 inhouse method.(based on BS 2646-1 : 2021)
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Standard No.	Certificate No.	Due Date
1. Temperature recorder	RTD	T210	T242028	11 December 2025
2. Temperature recorder	RTD	T211	T242029	11 December 2025
3. Temperature recorder	RTD	T212	T242030	11 December 2025

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Pressure Indicator 0.11-0.12 MPa At 121 °C Holding time 20 minute

5. Adjustment :

(X) without adjustment

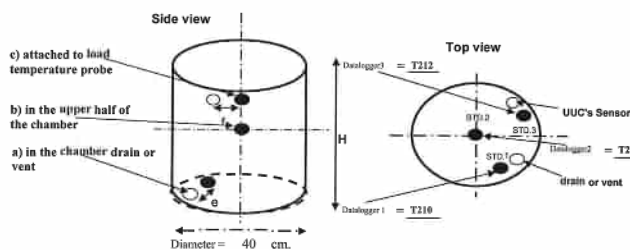
() after adjustment

Approved By Sujar Naknakred

Certificate No. T250353

Page 3 of 4

Calibration Report



Remark :

Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent e ≤ 10 cm.(less than or be equal to 10 cm.)

Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)

Size of Installed Standard sensor STD.3 : Distance UUC's Sensor f = 2 cm.

Measurement Results :

Calibration Point	Average Standard Reading at each position (°C)		
	T210	T211	T212
121	121.2	121.1	121.1

Autoclave			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor k
	Min ,	Max					
121	-	121	121.2	0.1	0.1	0.65	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

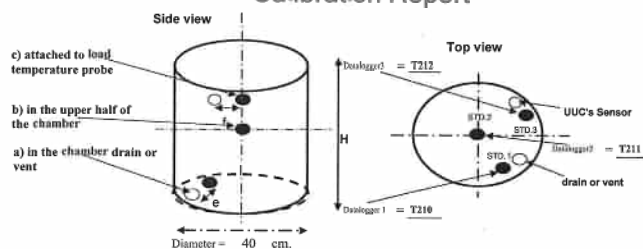
The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate

Approved By _____

Calibration Report



Remark :
Size of Installed Standard sensor STD.1 : Distance the chamber drain or vent $e \leq 10$ cm. (less than or be equal to 10 cm.)
Size of Installed Standard sensor STD.2 : Geometric Center (upper half of the chamber)
Size of Installed Standard sensor STD.3 : Distance UUC's Sensor $f = 2$ cm.

Measurement Results :

Calibration Point	Average Standard Reading at each position (°C)		
	T210	T211	T212
121	121.18	121.12	121.13

Autoclave			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (± °C)	Uncertainty (± °C)	Coverage Factor k
	Min, Max	Average					
121	-	121	121.16	0.10	0.10	0.65	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

End of Certificate

Approved By: 

FM-L13 108/30-05-57

Certificate of Calibration

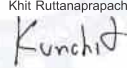
Cert. No.: 25TM1235
Page : 1 of 3

Equipment : Incubator
Manufacturer : Memmert
Model : IPP750eco
Serial No. : V821.0172
ID No. : BKK_ML0231

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : Incubation & Microbiological Reading

Received Order : 21 August 2025
Calibration Date : 21 August 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Ruttanaprapachai

Approved by : 
Approved Signatory

() Chakrit Waewwanjua
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 25 August 2025

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2508-0459OC-2

Cert. No.: 25TM1235
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 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	MY44073381	25LM82	TPA	17 May 2026

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

3. This measurement result is traceable to the International System of Unit maintained through :

Remark : TPA : Technology Promotion Association (Thailand - Japan)

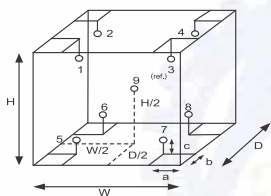
Result of Calibration :- () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	21	20
REL.Humid. (%)	62	65
AC Supply (Volt)	222	221

Position :	Ref. Std. ID No.:
1	25-01RTD-01
2	25-01RTD-02
3	25-01RTD-03
4	25-01RTD-04
5	25-01RTD-05
6	25-01RTD-06
7	25-01RTD-07
8	25-01RTD-08
9 (ref.)	25-01RTD-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 = 0.75 m³



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2508-0459OC-2
Result of Calibration :- () Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 25TM1235
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.12	0.37	0.43	2
37.0	37.0	37.0	0.15	0.47	0.49	2
41.5	41.5	41.5	0.13	0.79	0.84	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.834	34.929	34.924	34.849	34.856	34.954	35.002	35.002	35.127	0.30
37.0	36.940	37.065	37.010	36.921	36.883	36.973	37.043	37.045	37.235	0.31
41.5	41.641	41.838	41.742	41.484	41.249	41.427	41.466	41.495	41.926	0.34

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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Certificate of Calibration

Cert. No.: 25TM525
Page : 1 of 3

Equipment : Hot Air Oven

Manufacturer : Binder

Model : ED 240/E2

Serial No. : 00-15533

ID No. : BKK_ML0013

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

Location : Media Preparation Room

Received Order : 08 October 2025

Calibration Date : 09 October 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Uthen Kankawi

Approved by :

() Chakrit Waewwanjua

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 16 October 2025

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2510-0042OC-3
Procedure Used :-

Cert. No.: 25TM525
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.
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 MY59003411 24LM192 TPA 24 Dec 2025

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

3. This measurement result is traceable to the International System of Unit maintained through :

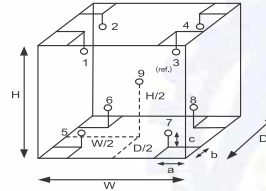
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	23	24
REL.Humid. (%)	54	56
AC Supply (Volt)	220	221



Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
W = 0.80 m
H = 0.60 m
Capacity = 0.24 m³

Position :	Ref. Std. ID No.:
1	23-20TC-01
2	23-20TC-02
3	23-20TC-03
4	23-20TC-04
5	23-20TC-05
6	23-20TC-06
7	23-20TC-07
8	23-20TC-08
9 (ref.)	23-20TC-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2510-0042OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 25TM525
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
170	170	170	0.45	1.3	2.3	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
170	169.588	170.427	168.486	168.900	169.725	169.499	168.946	169.327	169.529	1.3

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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Certificate of Calibration

Cert. No.: 26TM111
Page : 1 of 3

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 45

Serial No. : L712.0429

ID No. : BKK_ML0056

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

Location : Incubation & Microbiological Reading

Received Order : 04 February 2026

Calibration Date : 04 - 05 February 2026

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Preecha Hahib

Approved by :

() Chakrit Waewwanjua

(✓) Suwit Imjai

() Kunchit Promprat

Issue Date : 16 February 2026

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2602-0026OC-1
Procedure Used :-

Cert. No.: 26TM111
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY59003411	25LM177	TPA	26 Dec 2026

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

3. This measurement result is traceable to the International System of Unit maintained through :

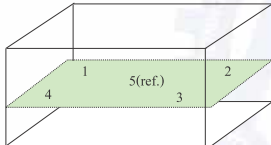
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	55	220
Finished of Calibration	20	69	220



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2602-0026OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 26TM111
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
44.5	44.4	44.4	44.462	44.470	44.480	44.460	44.457	0.15
45.0	44.9	44.9	44.958	44.971	44.983	44.965	44.966	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.051	0.025	2
45.0	0.047	0.032	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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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

Certificate of Testing

Cert.No.: 25TW145
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 15L103204
ID No. : BKK_EN0205
Received Date : 24 July 2025
Test Date : 25 July 2025
Reference : 2507-0836DSC-1
Submitted by :

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

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

Tested by : Walalak Sirithean

Approved by :
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 25 July 2025

REVIEW BY
APPROVED BY
NEXT CAL DATE..... 25/01/27



Cert.No.: 25TW145
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This measurement result is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	ID No.	Certificate No.	Due Date
1. Burette	130BU10	25CG1126	18 Mar 2027
2. Balance	140RC001	24MM601/1	16 Sep 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 23L100673

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.20	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study
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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Certificate of Calibration

Cert. No.: 25LM122
Page.: 1 of 2

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5100
Serial No. : 15L103204
ID No. : BKK_EN0205
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 24 July 2025
Calibrated Date : 25 July 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lernagatrakul

Approved by :
() Chakrit Waewwanjua
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 31 July 2025

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2507-0836DSC-2
Procedure Used :-

Cert. No.: 25LM122
Page.: 2 of 2

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	241022	TPA	17 Sep 2025

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This measurement result is traceable to the International System of Unit maintained through :
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 23L100673

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	80	20.003	19.74	-0.263	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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Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T252279

Certificate of Calibration

Page 1 of 4

Equipment : Chamber (Incubator)
Manufacturer : MEMMERT
Model : ICP 750
Serial No. : F818.0033
Customer Code : BKK_EN0272
ID No. : T8041A4
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250



Customer Location : Wet Chemistry Lab 2

Date of Receipt : 17 December 2025

Calibrated By : Atiphong Rongrat (Technician)

Approved By : Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 12 JAN 2026

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.



Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



Certificate No. T252279

Page 2 of 4

Calibration Report

Equipment : Chamber (Incubator)
Date of Calibration : 24 December 2025
Environment : Temperature : 23.4-24.9 °C
Line Voltage : 221.4-224.7 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 12 resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986).
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	31-(CH1-10)	T250835	24 May 2026
RTD	100 ohm	32-(CH1-10)	T250835	24 May 2026
DATA LOGGER	34970A	T193	T250835	24 May 2026

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244)

4. Condition of calibrated item : good

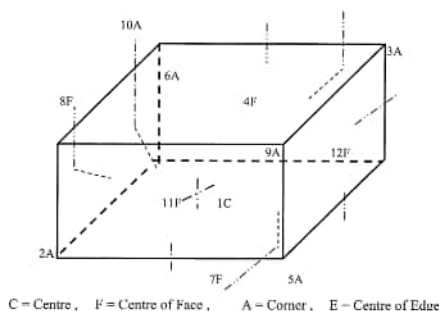
Equipment Description :

Time Constant : 2 Hour
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

Approved By : [Signature]

Calibration Report

1C	=	31-CH1
2A	=	31-CH2
3A	=	31-CH3
4F	=	31-CH4
5A	=	31-CH5
6A	=	31-CH6
7F	=	31-CH7
8F	=	31-CH8
9A	=	31-CH9
10A	=	31-CH10
11F	=	32-CH1
12F	=	32-CH2

Approved By: 

FM-TL07 102/27-03-68

Calibration Report**Measurement Results :**

Calibration Point	Average Standard Reading at each position (°C)											
	31-CH1	31-CH2	31-CH3	31-CH4	31-CH5	31-CH6	31-CH7	31-CH8	31-CH9	32-CH1	32-CH2	
20	20.11	20.22	20.03	20.39	20.12	19.80	19.89	20.19	20.26	19.97	19.85	20.06

Chamber (Incubator)		Temperature Distribution					
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Uncertainty (±°C)	Coverage Factor k
	Min	Max					
20.0	19.9	20.1	20.0	20.07	0.10	0.59	0.39

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By: 

FM-TL07 102/27-03-68

**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484**Certificate of Calibration**Cert.No.: 25CG3385
Page.: 1 of 2

Equipment : Burette
Capacity : 50 mL
Serial No. : -
ID. No. : BKK_EN0422
Manufacturer : Witeg
Made in : Germany
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Ambient Temperature : (20 ± 2.5) °C
Relative Humidity : (50 ± 10) %
Barometric Pressure : 753 mmHg
Calibration Procedure : ASTM E 542 - 01

Calibrated by : Srisuda Khamtha

Approved by : 

() Ponpan Paipim
(✓) Chakrit Waewwanjua

Issue Date : 3 September 2025

REVIEW BY: 
APPROVED BY: 
NEXT CAL DATE: 03/09/26



Equipment : Burette
Received Date : 1 September 2025
Condition As-Received : Used Item
Calibration Date : 3 September 2025
Reference : 2509-0049DSC-1

Cert.No.: 25CG3385
Page.: 2 of 2**Condition of this result of calibration**

1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	MS204TS	C226356983	140RC010	24MM603	TPA	10 Oct 2025
2) Data Logger	HL-20D	20683159	140EC012	24H2129	TPA	15 Oct 2025
3) Digital Thermometer	HH376	230806555	140EC013	25I1740	TPA	17 Jan 2026

This measurement result is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.
3. True value is converted to true volume at the standard temperature of 20 °C

Calibration result :

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
10	9.9941	0.0082	2.00
25	24.9804	0.0087	2.00
50	49.9819	0.010	2.00

Remark mL = cm³

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

-00-

The Uncertainties are for a confidence probability of approximately 95%

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



Certificate No. T252276

Certificate of Calibration

Page 1 of 4

Equipment : Hot Block
Manufacturer : Environmental Express
Model : B3000-240
Serial No. : 2021CODW148
Customer Code : BKK_EN0370
ID No. : T2940A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Wet Chemistry Lab2
Date of Receipt : 17 December 2025
Calibrated By : Sujjar Naknakred (Site Calibration Manager)
Approved By :  / Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 06 JAN 2026

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

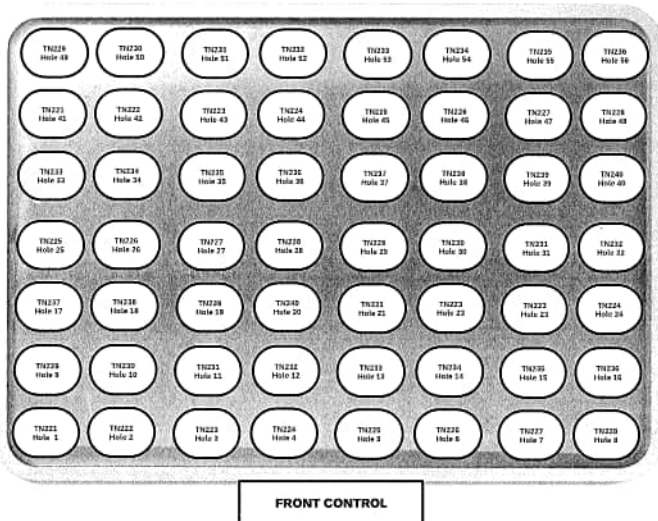
FM-TL04 102/27-03-68



Certificate No. T252276

Page 3 of 4

Calibration Report



FRONT CONTROL

Approved By: 

FM-TL05 102/27-03-68



Certificate No. T252276

Page 2 of 4

Calibration Report

Equipment : Hot Block
Date of Calibration : 23 December 2025
Environment : Temperature : 24°C - 24.4°C
Line Voltage : 221.3 V - 225.6 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

- This equipment was calibrated by insert 29 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN221-TN230	T251759	17 October 2026
TC	TYPE T	TN231-TN240	T251759	17 October 2026
DATA LOGGER	34970A	T261	T251759	17 October 2026
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)
- Condition of calibrated item : good
Equipment Description :
Time Constant ☐ 1 Hour ☐ 37 Minute At 150 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment :
() without adjustment (X) after adjustment

Approved By: 

FM-TL05 102/27-03-68



Certificate No. T252276

Page 4 of 4

Calibration Report

Measurement Results

		Average Standard Reading at each position (°C)																					
CAL POINT		TN221 Hole 1	TN222 Hole 2	TN223 Hole 3	TN224 Hole 4	TN225 Hole 5	TN226 Hole 6	TN227 Hole 7	TN228 Hole 8	TN229 Hole 9	TN230 Hole 10												
1 5 0	Max °C	149.91	150.71	150.47	150.02	149.97	150.84	150.72	150.75	150.45	149.98	149.98	149.98	149.98	149.98	149.98							
	Min °C	149.18	150.18	149.80	149.36	149.59	150.31	149.77	150.44	149.46	149.53	149.53	149.53	149.53	149.53	149.53							
	Average °C	149.55	150.44	150.13	149.69	149.78	150.58	149.99	150.59	149.95	149.76	149.76	149.76	149.76	149.76	149.76							
CAL POINT		TN231 Hole 11	TN232 Hole 12	TN233 Hole 13	TN234 Hole 14	TN235 Hole 15	TN236 Hole 16	TN237 Hole 17	TN238 Hole 18	TN239 Hole 19	TN240 Hole 20												
1 5 0	Max °C	150.12	150.09	149.84	150.13	150.67	150.36	150.65	150.21	150.30	150.12	150.12	150.12	150.12	150.12	150.12							
	Min °C	149.57	149.50	149.55	149.59	150.38	150.06	149.73	149.84	149.52	149.59	149.59	149.59	149.59	149.59	149.59							
	Average °C	149.85	149.79	149.75	149.86	150.51	150.21	150.19	150.02	149.91	149.86	149.86	149.86	149.86	149.86	149.86							
CAL POINT		TN221 Hole 21	TN222 Hole 22	TN223 Hole 23	TN224 Hole 24	TN225 Hole 25	TN226 Hole 26	TN227 Hole 27	TN228 Hole 28	TN229 Hole 29	TN230 Hole 30												
1 5 0	Max °C	150.10	149.78	150.36	150.52	150.24	149.78	149.81	149.61	150.36	150.05	150.05	150.05	150.05	150.05	150.05							
	Min °C	149.57	149.30	149.42	149.84	150.00	149.53	149.14	149.38	150.04	149.69	149.69	149.69	149.69	149.69	149.69							
	Average °C	149.83	149.59	149.89	150.23	150.12	149.65	149.48	149.49	150.20	149.87	149.87	149.87	149.87	149.87	149.87							
CAL POINT		TN231 Hole 31	TN232 Hole 32	TN233 Hole 33	TN234 Hole 34	TN235 Hole 35	TN236 Hole 36	TN237 Hole 37	TN238 Hole 38	TN239 Hole 39	TN240 Hole 40												
1 5 0	Max °C	150.07	149.46	149.52	149.93	150.05	150.20	149.69	149.70	150.04	149.73	149.73	149.73	149.73	149.73	149.73							
	Min °C	149.49	149.30	149.39	149.70	149.66	149.68	149.35	149.33	149.75	149.46	149.46	149.46	149.46	149.46	149.46							
	Average °C	149.78	149.38	149.46	149.80	149.85	149.94	149.52	149.52	149.90	149.60	149.60	149.60	149.60	149.60	149.60							
CAL POINT		TN221 Hole 41	TN222 Hole 42	TN223 Hole 43	TN224 Hole 44	TN225 Hole 45	TN226 Hole 46	TN227 Hole 47	TN228 Hole 48	TN229 Hole 49	TN230 Hole 50												
1 5 0	Max °C	149.51	150.32	150.30	149.69	149.91	149.93	150.14	149.58	149.93	150.29	150.29	150.29	150.29	150.29	150.29							
	Min °C	149.18	149.81	149.56	149.44	149.38	149.60	149.61	149.27	149.36	149.48	149.48	149.48	149.48	149.48	149.48							
	Average °C	149.35	150.07	149.93	149.57	149.65	149.77	149.87	149.42	149.64	149.84	149.84	149.84	149.84	149.84	149.84							
CAL POINT		TN231 Hole 51	TN232 Hole 52	TN233 Hole 53	TN234 Hole 54	TN235 Hole 55	TN236 Hole 56																
1 5 0	Max °C	150.25	150.40	150.59	150.13	150.57	150.43	150.43	150.43	150.43	150.43	150.43	150.43	150.43	150.43	150.43							
	Min °C	149.31	149.89	150.13	149.68	149.75	149.87	149.87	149.87	149.87	149.87	149.87	149.87	149.87	149.87	149.87							
	Average °C	149.78	150.14	150.36	149.90	150.16	150.15	150.15	150.15	150.15	150.15	150.15	150.15	150.15	150.15	150.15							
		Hot Block					Temperature Distribution																
		Setting (°C)		Reading (°C)			Stability (± °C)		Uncertainty (± °C)														
				Min, Max	Average																		
		150		149.9 , 150.1	150.0		0.50		1.01														

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate

Approved By: 

FM-TL05 102/27-03-68



Certificate of Calibration

Cert.No.: 25CHO537
Page.: 1 of 3

Equipment : Spectrophotometer
Manufacturer : HACH
Model : DR3900
Serial No. : 2021559
ID No. : BKK_EN0356
Condition As-Received: Used Item
Received Date : 08 October 2025
Calibration Date : 08 October 2025
Reference : 2510-0042OC-11
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Calibration Place : Wet Chemistry Lab 2
Ambient Temperature : (21.9 to 21.9) °C (On-Site)
Relative Humidity : (62 to 65) % (On-Site)
Calibration Procedure : In - house method :
CP-0CH4 based on ASTM E 275-08
Calibrated by : Uthen Kankawi
Approved by :
() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai
Issue Date : 9 October 2025

REVIEW BY *Junda K*
APPROVED BY *Saithip P*
NEXT CAL DATE 08/10/26

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	44487	122584	31 May 2026
2. Wavelength Standard set	36730	118120	15 Jan 2026
3. Wavelength Standard set	36730	118121	15 Jan 2026

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 through :
- Starna Scientific Ltd.
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 k
418.40	418	0.59	2.00
479.88	480	0.59	2.00
513.75	513	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

The Uncertainties are for a confidence probability of approximately 95%

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



Cert. No. : 25CHO537
Page : 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor k
420.0	Zero	0.000	0.0028	2.00
	0.5750	0.573	0.0028	2.00
	0.7156	0.713	0.0028	2.00
	1.0176	1.014	0.0028	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5598	0.557	0.0028	2.00
	0.7037	0.700	0.0028	2.00
	1.0013	0.997	0.0028	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5222	0.522	0.0028	2.00
	0.6646	0.664	0.0028	2.00
	0.9444	0.945	0.0028	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5234	0.523	0.0028	2.00
	0.7007	0.700	0.0028	2.00
	0.9992	0.999	0.0028	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5573	0.556	0.0028	2.00
	0.7760	0.773	0.0028	2.00
	1.1104	1.108	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5648	0.565	0.0028	2.00
	0.7654	0.765	0.0028	2.00
	1.0961	1.096	0.0028	2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- UUC = Unit Under Calibration

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

-000-



Certificate of Calibration

Equipment: pH METER
Manufacturer: SI Analytics
Model: TitroLine 7000
Serial No.: 10013826
ID No.: BKK_EN0373
Condition of the item: Normal
Certificate No.: C07250317
Job No.: WO-00076560
Issued Date: 30 June 2025
Due Date: 30 June 2026
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22.3 °C ± 0.1 °C
Relative Humidity 56.3 % ± 0.4 %

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr.Pongpisut Suebchantha

Calibration Date: 30 June 2025

The Method Used: In house method, CAL-WI-58, base on ASTM E 70-07

Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Harrod cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 1100242, 1100244, 1034231 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20240602EA

Wongpisut Suebchantha
(Mr. Pongpisut Suebchantha)
Person in charge

Miss Kaewkan Suradech
(Miss Kaewkan Suradech)
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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).
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.

Calibration Results:

pH Scale

Input (mV)	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	413.9	-0.22	0.000	0.065	2.00
354.96	354.8	-0.16	1.000	0.065	2.00
295.8	295.7	-0.10	2.001	0.065	2.00
236.64	236.6	-0.04	3.001	0.065	2.00
177.48	177.4	-0.08	4.000	0.065	2.00
118.32	118.3	-0.02	5.000	0.065	2.00
59.16	59.1	-0.06	6.000	0.065	2.00
0	0.0	0.00	7.000	0.065	2.00
-59.16	-59.1	0.06	8.000	0.065	2.00
-118.32	-118.3	0.02	9.000	0.065	2.00
-177.48	-177.4	0.08	10.000	0.065	2.00
-236.64	-236.5	0.14	11.000	0.065	2.00
-295.8	-295.6	0.20	12.000	0.065	2.00
-354.96	-354.8	0.16	13.000	0.065	2.00
-414.12	-413.9	0.22	14.000	0.065	2.00

Sample Test Results

Manufacturer: Thermo Scientific Model: 8157BNUMD Electrode Serial No.: BW1-13563

The three-point calibration using three standard buffer solutions; pH 4.007, pH 6.988 and pH 10.010

- During calibration, display of pH meter can be adjust to reading; pH 4.007, pH 6.988 and pH 10.010

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.007	3.999	-0.008	0.0086	2.28
6.988	6.993	0.005	0.0085	2.00
10.010	10.013	0.003	0.013	2.00

Practical slope and zero point*

The three-point calibration using three standard buffer solutions; pH 4.007, pH 6.988 and pH 10.010

- During calibration, display of pH meter can be adjust to reading; pH 4.007, pH 6.988 and pH 10.010

The practical slope of the pH electrode; 57.73 (mV/pH), 97.58%

The zero point of the pH electrode; 6.41 (pH)

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

The End of Certificate

Checklist for pH Meter

Worksheet number: WO-00076560

Instrument type: pH METER

Model: TitroLine 7000

S/N: 10013826

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Switch	☒	☐	
☒	☐	4. Keypad	☒	☐	
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Electrode and Connection Cable	☒	☐	
☒	☐	7. Electrode (Level KCl)	☒	☐	
☒	☐	8. Electrode (Dust Protection Hood)	☒	☐	
☒	☐	9. Stand	☒	☐	

Recommend : _____

Mr.Pongpisut Suebchantha
Service Engineer



Certificate of Calibration

Equipment : Digital Thermometer with Probe

Manufacturer: SI Analytics

Model: TitroLine 7000

Serial No.: 10013826

ID No.: BKK_EN0373

Condition of the item: Normal

Certificate No.: C15250720

Job No.: WO-00076560

Issued Date: 1 July 2025

Due Date: 30 June 2026

Page: 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd.
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Environment Condition : Temperature: 30 °C ± 10 °C
Humidity: 55 %RH ± 25 %RH
Voltage: 220 VAC ± 10 %

Calibration Place : ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Calibration By : Ms. Kaewkan Suradech

Calibration Date : 30 June 2025

The Method used : In house method, CAL-WI-69, by comparison with standard thermometer

Traceability : This certificate is traceable to the International System of Unit maintained by: Quality Reborn Co.,Ltd. (QR)

(Miss Kaewkan Suradech)
Person in charge

(Mr. Tweewong Thaitiang)
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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).
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.

Reference standard equipment:

Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-2043	21 August 2024	21 August 2025

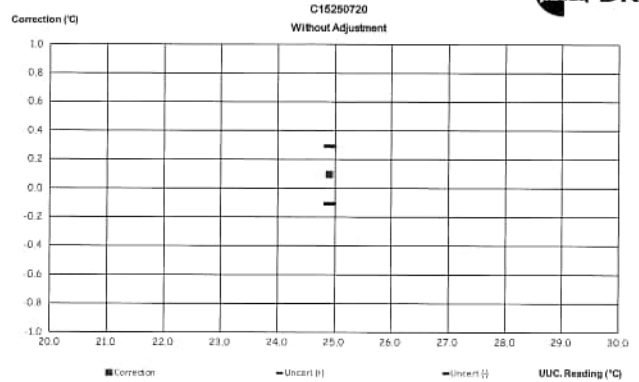
Calibration Results:

Without Adjustment

Sensor Type: RTD Electrode Serial No.: BW1-13563 Channel: -
Diameter (mm): 12 Length (mm): 120 Immersion (mm): 120

Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.984	24.9	0.094	0.20

The End of Certificate



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CAL-FM-C15-15: 30 Jun 2025

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ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ (Digital Thermometer Checklist)

Equipment : Digital Thermometer with Probe

Certificate No. : C15250720

Serial No. : 10013826

Model : TitroLine 7000

Check Date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
30-Jun-2025			30-Jun-2025		
Normal	Defective		Normal	Defective	
		General			
☒	☐	1. สายไฟ (Electric wire)	☒	☐	
☒	☐	2. Adaptor / Power supply 220 / 110 VAC	☒	☐	
☒	☐	3. การทำงาน (On/Off Switch)	☒	☐	
☒	☐	4. การทำงาน (Selector Key)	☒	☐	
☒	☐	5. หน้าจอแสดงผล (Display)	☒	☐	
☐	☐	6. แบตเตอรี่ (Battery)	☐	☐	ไม่มี
☒	☐	7. สภาพตัวเครื่อง (Equipment Body)	☒	☐	
☒	☐	8. หัววัดเซ็นเซอร์ (Sensor (In / Ex)	☒	☐	

Note : _____

Ms. Kaewkan Suradech
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
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2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10260
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Phone: +66 2559 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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Certificate of Calibration

Equipment: CONDUCTIVITY METER
Manufacturer: Thermo Scientific
Model: ORION STAR A215
Serial No.: X58031
ID No.: BKK_EN0373
Condition of the item: Normal

Certificate No.: C24250156
Job No.: WO-00076560
Issued Date: 30 June 2025
Due Date: 30 June 2026
Page: 1 of 2

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22.5 °C ± 0.1 °C
Relative Humidity 56.2 % ± 0.4 %

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Pongpisut Suebchantha
Calibration Date: 30 June 2025
The Method Used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14
Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 1066607, 1066608, 1066609

(Mr. Pongpisut Suebchantha)

Person in charge

(Miss Kaewkan Suradech)
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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).
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 2559 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FM-C24-18: 30 Jun 2025

Calibration Results:

Manufacturer: Thermo Scientific Model: ORION 013005MD Electrode Serial No.: YV1-18416

Before Adjustment

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
84.003 $\mu\text{S/cm}$	91.88 $\mu\text{S/cm}$	-7.877 $\mu\text{S/cm}$	2.00	0.68 $\mu\text{S/cm}$
1413.1 $\mu\text{S/cm}$	1445 $\mu\text{S/cm}$	-31.9 $\mu\text{S/cm}$	2.00	11 $\mu\text{S/cm}$
12.881 mS/cm	13.06 mS/cm	-0.179 mS/cm	2.00	0.098 mS/cm

After Adjustment : at 84.003 $\mu\text{S/cm}$, 1413.1 $\mu\text{S/cm}$, 12.880 mS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
84.003 $\mu\text{S/cm}$	84.14 $\mu\text{S/cm}$	-0.137 $\mu\text{S/cm}$	2.00	0.68 $\mu\text{S/cm}$
1413.1 $\mu\text{S/cm}$	1413 $\mu\text{S/cm}$	0.1 $\mu\text{S/cm}$	2.00	11 $\mu\text{S/cm}$
12.881 mS/cm	12.89 mS/cm	-0.009 mS/cm	2.00	0.098 mS/cm

The End of Certificate

Worksheet number: WO-00076560

Instrument type: Conductivity Meter

Model: ORION STAR A215

S/N: X58031

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Switch	☒	☐	
☒	☐	4. Keypad	☒	☐	*
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Electrode and Connection Cable	☒	☐	
☐	☐	7. Electrode (Dust Protection Hood)	☐	☐	
☒	☐	8. Stand	☒	☐	

Recommend : * ปิดฝาป้องกันขั้วไฟฟ้า

Mr. Pongpisut Suebchantha
Service Engineer

Certificate No.: C15250721

Page: 2 of 2



Certificate of Calibration

Equipment : Digital Thermometer with Probe

Certificate No.: C15250721

Manufacturer: Thermo Scientific

Job No.: WO-00076560

Model: ORION STAR A215

Issued Date: 1 July 2025

Serial No.: X58031

Due Date: 30 June 2026

ID No.: BKK_EN0373

Page: 1 of 2

Condition of the item: Normal

Customer : ALS Laboratory Group (Thailand) Co., Ltd.
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 ThailandEnvironment Condition : Temperature: 30 °C ± 10 °C
Humidity: 55 %RH ± 25 %RH
Voltage: 220 VAC ± 10 %Calibration Place : ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Calibration By : Ms. Kaewkan Suradech

Calibration Date : 30 June 2025

The Method used : In house method, CAL-WI-69, by comparison with standard thermometer

Traceability : This certificate is traceable to the International System of Unit maintained by:
Quality Reborn Co., Ltd. (QR)(Miss Kaewkan Suradech)
Person in charge(Mr. Tweewong Thaitiang)
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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (JCGM 100).
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.

Reference standard equipment:

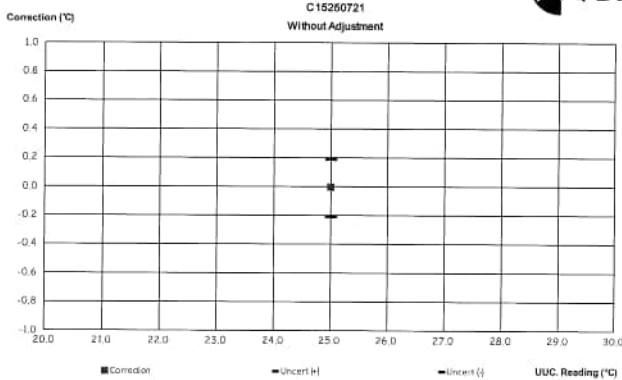
Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-2043	21 August 2024	21 August 2025

Calibration Results:

Without Adjustment

Sensor Type: RTD		Electrode Serial No.: YV1-18416		Channel: -
Diameter (mm): 15		Length (mm): 120		Immersion (mm): 120
Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.994	25.0	-0.006	0.20

The End of Certificate



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ (Digital Thermometer Checklist)

Equipment : Digital Thermometer with Probe

Certificate No. : C15260721

Serial No. : X58031

Model : ORION STAR A215

Check Date		รายการตรวจเช็ค (Description)	Check before delivery		หมายเหตุ (Remark)
30-Jun-2025			30-Jun-2025		
Normal	Defective		Normal	Defective	
			<i>General</i>		
☒	☐	1. สายไฟ (Electric wire)	☒	☐	
☒	☐	2. Adaptor / Power supply 220 / 110 VAC	☒	☐	
☒	☐	3. การทำงาน (On/Off Switch)	☒	☐	
☒	☐	4. การทำงาน (Selector Key)	☒	☐	
☒	☐	5. หน้าจอแสดงผล (Display)	☒	☐	
☐	☐	6. แบตเตอรี่ (Battery)	☐	☐	ไม่มี
☒	☐	7. สภาพตัวเครื่อง (Equipment Body)	☒	☐	
☒	☐	8. หัววัดเซ็นเซอร์ (Sensor (In / Ex)	☒	☐	

Note :

Ms. Kaewkan Suradech

Service Engineer

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2533 Sukhumvit Road, Bangkok, Prachinburi, Bangkok 10250
Phone : +66 2039 7000 Email : info.canton@dsh.com Website : www.dksh.com/certificat-thailand

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Certificate of Calibration

Certificate No.: C32250030 Page: 2 of 2

Calibration Results:

Nominal Volume 20 ml

Manufacturer: SI Analytics

Burettes Model: TZ 3920

Serial No., Nr: 007734

Exchange Unit Model: WA-20

Exchange Unit Serial No.: 10045524

Nominal Vol.: 20 ml

Piston burettes of volumetric apparatus for automatic titrator

Volume (%)	Volume (ml)	Measurement Volume (V _m) (ml)	Systematic error (trueness)		Random error (precision)		Measurement Uncertainty (μl)	k
			es (%)	es (μl)	CV (%)	S _r (μl)		
10%	2.0000	1.9997	-0.002	-0.3	0.004	0.7	0.73	2.04
50%	10.0000	10.0076	0.038	7.6	0.003	0.7	1.0	2.00
100%	20.0000	20.0026	0.013	2.6	0.003	0.6	1.5	2.00

Equipment: Automatic Titrator
Manufacturer: SI Analytics
Model: TitroLine 7000
Serial No.: 10013826
ID No.: BKK_EN0373
Type of Titration: Motor - driven
Condition of the item: Normal

Certificate No.: C32250030
Job No.: WO-00076560
Issued Date: 30 June 2025
Due Date: 30 June 2026
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22 °C ± 0.4 °C
Relative Humidity 58 % ± 1.4 %
Atmospheric Pressure 1009 mbar ± 0.4 mbar

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 30 June 2025

The Method Used: In house method, CAL-WI-57, base on ISO 8655:2002

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C01243206

ISO 8655-3:2002(E) Table 1 - Maximum permissible errors for motor-driven piston burettes

Nominal volume	Maximum permissible systematic error		Maximum permissible random error	
	± %	± μl ^a	± % ^b	± μl ^c
≤1	0.6	6	0.1	1
2	0.5	10	0.1	2
5	0.3	15	0.1	5
10	0.2	20	0.07	7
20	0.2	40	0.07	14
25	0.2	50	0.07	17.5
50	0.2	100	0.05	25
100	0.2	200	0.03	30

a Expressed as the deviation of the mean of tenfold measurement from the nominal volume or from the selected volume (see ISO 8655-6:2002, 8.4)

b Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

c Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

The End of Certificate

(Mr. Atachai Ngamchanat)
Person in charge

(Miss Kaewkan Suradech)
Authorized signatory

This certificate is issued in 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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM 1995).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. This report shall not be reproduced except in full without approval of DKSH Technology Limited.

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Phone : +66 2039 7000 Email : info.canton@dsh.com Website : www.dksh.com/certificat-thailand

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CAL-FM-C32-12: 30 Jun 2025

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2533 ซอยสุขุมวิท 40, กรุงเทพมหานคร 10250
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CAL-FM-C32-12: 30 Jun 2025

Checklist for Automatic Titrator

Worksheet number: WO-00076560

Instrument type: Automatic Titrator Model: TitroLine 7000

S/N: 10013826

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Switch	☒	☐	
☒	☐	4. Keypad	☒	☐	
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Piston Burettes	☒	☐	
☒	☐	7. Function Rinsing and Dosing	☒	☐	
☒	☐	8. Dosing silicone tube and Accessories	☒	☐	

Recommend :

Mr. Atachai Ngamchanat
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 สุขุมวิท 101/1 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Phraekhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

CAL-FM-R55-00: 8 Apr 2025

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Certificate of Calibration

Equipment: Automatic Titrator
Manufacturer: SI Analytics
Model: TitroLine 7000
Serial No.: 10013826
ID No.: BKK_EN0373
Type of Titration: Motor-driven
Condition of the item: Normal

Certificate No.: C32250031
Job No.: WO-00076560
Issued Date: 30 June 2025
Due Date: 30 June 2026
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22 °C ± 0.2 °C
Relative Humidity 56 % ± 1.9 %
Atmospheric Pressure 1009 mbar ± 0.2 mbar

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)
104 Soi Pattanakarn 40, Pattanakarn Rd.,
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 30 June 2025

The Method Used: In house method, CAL-WI-57, base on ISO 8655:2002

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C01243206

(Mr. Atachai Ngamchanat)

Person in charge

This certificate is issued in 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 Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM 100).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. This report shall not be reproduced except in full without approval of DKSH Technology Limited.

(Miss Kaewkan Suradech)

Authorized signatory

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2533 สุขุมวิท 101/1 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C32-12: 30 Jun 2025

Certificate No.: C32250031 Page: 2 of 2

Calibration Results:

Nominal Volume 20 ml

Manufacturer: SI Analytics Burettes Model: TZ 3920 Serial No., Nr: 007773
Exchange Unit Model: WA-20 Exchange Unit Serial No.: 10045489 Nominal Vol.: 20 ml

Piston burettes of volumetric apparatus for automatic titrator

Volume (%)	Volume (ml)	Measurement Volume (V _m) (ml)	Systematic error (trueness)		Random error (precision)		Measurement Uncertainty (μl)	k
			es (%)	es (μl)	CV (%)	S _r (μl)		
10%	2.0000	2.0009	0.004	0.9	0.004	0.7	0.73	2.04
50%	10.0000	10.0050	0.025	5.0	0.002	0.4	0.90	2.00
100%	20.0000	20.0054	0.027	5.4	0.003	0.5	1.5	2.00

ISO 8655-3:2002(E) Table 1 - Maximum permissible errors for motor-driven piston burettes

Nominal volume ml	Maximum permissible systematic error		Maximum permissible random error	
	± %	± μl *	± % *	± μl *
≤1	0.6	6	0.1	1
2	0.5	10	0.1	2
5	0.3	15	0.1	5
10	0.2	20	0.07	7
20	0.2	40	0.07	14
25	0.2	50	0.07	17.5
50	0.2	100	0.05	25
100	0.2	200	0.03	30

a Expressed as the deviation of the mean of tenfold measurement from the nominal volume or from the selected volume (see ISO 8655-6:2002, 8.4)

b Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

c Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 สุขุมวิท 101/1 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Phraekhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

CAL-FM-R55-00: 8 Apr 2025

Delivering Growth - in Asia and Beyond.

Checklist for Automatic Titrator

Worksheet number: WO-00076560

Instrument type: Automatic Titrator Model: TitroLine 7000

S/N: 10013826

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
☒	☐	1. Integrity of the tools	☒	☐	
☒	☐	2. Cleanliness of tools	☒	☐	
☒	☐	3. On-Off Switch	☒	☐	
☒	☐	4. Keypad	☒	☐	
☒	☐	5. Display, Screen Contrast	☒	☐	
☒	☐	6. Piston Burettes	☒	☐	
☒	☐	7. Function Rinsing and Dosing	☒	☐	
☒	☐	8. Dosing silicone tube and Accessories	☒	☐	

Recommend :

Mr. Atachai Ngamchanat
Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 สุขุมวิท 101/1 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangkok, Phraekhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-R55-00: 8 Apr 2025



Certificate of Calibration

Cert. No.: 25LM134
Page.: 1 of 2

Equipment : DO Meter with Sensor

Manufacturer : Mettler Toledo

Model : Seven2Go Pro

Serial No. : B619449111

ID No. : CHM_LG0002

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

Location : TPA On Site Calibration Laboratory

Received Order : 18 August 2025

Calibrated Date : 19 August 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lerngagtrakul

Approved by :

() Chakrit Waewwanjua

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 19 August 2025

The Uncertainties are for a confidence probability of approximately 95%

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

REVIEW BY *Chakrit Waewwanjua*

APPROVED BY *Warakorn Lerngagtrakul*

NEXT CAL DATE: 19/08/26



Equipment : DO Meter with Sensor

Condition As-Received : Used Item

Reference : 2508-0517DSC-6

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	2188080	241022	TPA	17 Sep 2025

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

3. This measurement result is traceable to the International System of Unit maintained through :

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 497482

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	80	20.002	20.1	0.098	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 %.

-00-



Certificate of Testing

Cert.No.: 25TW154
Page.: 1 of 2

Equipment : DO Meter

Manufacturer : Mettler Toledo

Model : Seven2Go Pro

Serial No. : B619449111

ID No. : CHM_LG0002

Received Date : 18 August 2025

Test Date : 19 August 2025

Reference : 2508-0517DSC-5

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

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %

Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithean

Approved by :

() Chakrit Waewwanjua

() Ponpan Paipim

(✓) Saithip Meangmai

Issue Date : 20 August 2025

Saithip
Approved Signatory



Cert.No.: 25TW154
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This measurement result is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	ID No.	Certificate No.	Due Date
1. Burette	130BU10	25CG1126	18 Mar 2027
2. Balance	110RC001	25MM316	02 July 2026

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 497482

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.22	8.24	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study
Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced
other in full, without written approval of the laboratory

-00-



Certificate of Calibration

Cert. No.: 25TM528
Page : 1 of 3

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 29

Serial No. : L622.0282

ID No. : BKK_EN0439

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

Location : Organic Preparation Lab

Received Order : 08 October 2025

Calibration Date : 09 October 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Kunchit Promprat

Approved by :

() Chakrit Waewwanjua

() Ponpan Paipim

(✓) Suwit Imjai

Issue Date : 28 October 2025

The Uncertainties are for a confidence probability of approximately 95%

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

REVIEW BY: *Jinda K*
APPROVED BY: *Sinluk P*
NEXT CAL DATE: 09/10/26



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2510-00420C-13
Procedure Used :-

Cert. No.: 25TM528
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 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	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY58041391	25LM20	TPA	08 Feb 2026

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

3. This measurement result is traceable to the International System of Unit maintained through :

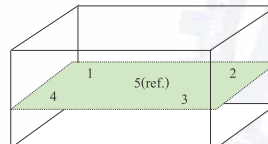
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	63	224
Finished of Calibration	24	58	224



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2510-00420C-13
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 25TM528
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			Position					
			1	2	3	4	5 (ref.)	
85.0	85.0	85.0	84.863	84.748	84.869	84.990	84.966	0.21

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
85.0	0.33	0.12	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 %.

-00-



Certificate of Calibration

Cert.No.: 25CH1162
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Hach
Model : HQ411d
Serial No. : 200100031163
ID No. : BKK_EN0342
Condition As-Received : Used Item
Received Date : 08 October 2025
Calibration Date : 09 October 2025
Reference : 2510-0271DSC-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walalak Sirithean

Approved by :

() Chakrit Waewwanjua

() Ponpan Paipim

(✓) Sathip Meangmai

Issue Date : 10 October 2025

REVIEW BY: *Jinda K*
APPROVED BY: *Sinluk P*
NEXT CAL DATE: 09/10/26

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.



Cert.No.: 25CH1162
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Ref. Standard Thermometer	4982054	110RC044	25I708	03 July 2026

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1114384	12 June 2027
pH 6.965	CPA chem	1066667	18 Jan 2026
pH 10.010	CPA chem	1135355	16 Aug 2026

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

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 252063043080	4.007	3.996	176.6	0.0046	2.00
	6.965	6.974	1.1	0.0084	2.00
	10.010	9.996	-176.9	0.0070	2.00

Remark - Can not connect the BNC because the plug does not match with the socket.



Cert.No.: 25CH1162
Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : PHC281
- Serial No. : 252063043080
Dimension of probe
- Length : 103 mm.
- Diameter : 12 mm.
- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.001	25.0	-0.001	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 %.

-o0o-



SmartChem® 600 - Maintenance report Rev.03

Smartchem 600



Maintenance report

Instrument S/N: 2401055

Installed at: ALS Laboratory Group (Thailand) Co., Ltd.

Address: 104 Phatthanakan 40 Alley, Phatthanakan, Suan Luang, Bangkok Thailand

Contact: Arraya Meechai Telephone: 02 760 3000

E-mail: arraya.meechai@alsglobal.com

Date of maintenance: 15-Jul-2025

Service engineer: Apirom, Samphan



SmartChem® 600 - Maintenance report Rev.03

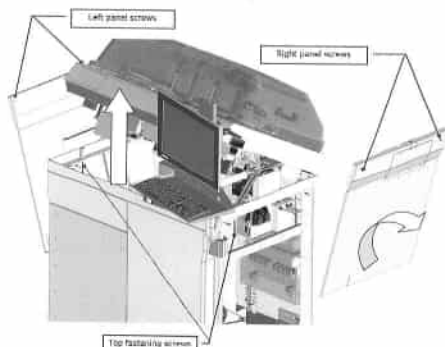
Maintenance procedure

Preliminary checks		
1)	Check problems encountered by the operator while using the instrument Remarks:	☒
2)	Check of the "Event logs" ➢ Access the "Event logs" page ("Archive" → "Event logs") ➢ Filter at least the past two months in order to check if any error have occurred Remarks:	☒
3)	Verify results of WBL (to verify correct operation of the spectrometer, reagents arms and reactions plate) Remarks:	☒
4)	Check for leaks/overflows ➢ Check the coloration of the washing wells (washing wells should be white without any trace of coloration) ➢ Check the absence of dry stain under and inside the instrument (it could be evidence of old leaks/overflows) Remarks:	☒
5)	Check the correct execution of the Home procedure ➢ Access diagnostic area ("Maintenance" → "Diagnostic") ➢ Select the "Home all motors" item in order to perform the general reset of the instrument and wait until the procedure is completed ➢ Make sure that all the Home Sensors light up in green Remarks:	☒

Maintenance procedure

Instrument preparation

- Remove the right side panel
- Remove the left side panel
- Unscrew the two top fastening screws and then lift up the top till the security lock falls and secure the machine in opened position
- Open the main door and gates of the Hydraulic compartment on the back right side
- Open the door of the Electronic compartment on the back left side



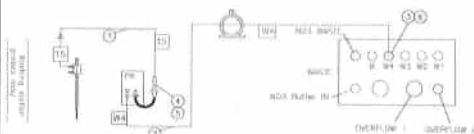
Remarks:

- 2) Washing station - emptying the drain line of the 1st cannula
- Access diagnostic area ("Maintenance" → "Diagnostic") and open the "Washing station" page
 - Activate the "Probe 1 empty..." for at least 10 seconds

Remarks:

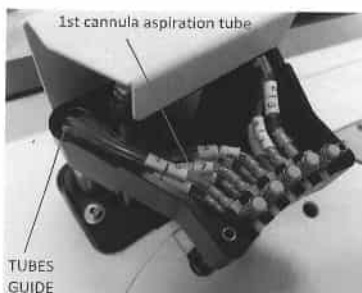
3)	Drain the hydraulic circuit of the EC module (if installed) ➤ Access diagnostic area ("Maintenance" → "Diagnostic") ➤ Perform the mechanical reset of the Instrument ("Main" page → "Home all motors") ➤ Remove the cannula from the "DI water" bottle Access the "EC" page and run 10 times the "Purge" feature Remarks: Don't installed.	☐
4)	Drain the hydraulic circuit of the NO3 module (if installed) ➤ Access diagnostic area ("Maintenance" → "Diagnostic") ➤ Perform the mechanical reset of the Instrument ("Main" page → "Home all motors") ➤ Remove the cannula from the "Imidazole" bottle ➤ Access the "NO3" page and run 2 times the "Liquids prime" feature Remarks: Customer stop to use NO3 module because the Cadmium Cold was defective.	☐
5)	Perform all updates ➤ Windows update ➤ Software update Remarks: For Windows update: We will cooperate with IT of ALS to update Windows For Software update: We will make appointment with ALS to update Software when we have new version of Software.	☒
6)	Instrument cleaning ➤ Clean the fan of the power supply (using a vacuum cleaner if possible) ➤ Internal and external cleaning of the instrument to eliminate traces of old liquid leaks ➤ Remove all tubings from the inlet tanks and wash the inlet tanks with 5% sodium hypochlorite or 5% HCl ➤ Manually check the correct dispensation of each cannula of the washing station using a syringe with distilled water NOTE: do not inject air in order to prevent any kind of damage of the power supply due to injection of the dust inside it Remarks:	☒

Washing station - tube replacement on 1st cannula



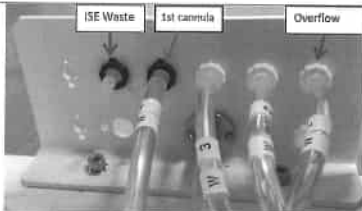
WARNING! BIOHAZARD RISK WHEN REMOVING TUBES. USE APPROPRIATE PROTECTIONS

- 7) ➤ Locate the 1st washing station cannula loading tube "ID 15". Unplug it from the 1st cannula and slide it down through the tubes guide



- Unplug the tube "ID 15" from "uP8" in washing station pump compartment

	Install the new tube "ID 15" respecting the routing shown in the figure
Replace tube "W4" from pump "uP8" to the waste tubes panel	Install the new tube "ID 15" respecting the routing shown in the figure

		
Remarks:		
8)	Filters replacement on drain lines	☒
WARNING! BIOHAZARD RISK WHEN REMOVING TUBES. USE APPROPRIATE PROTECTIONS		☒
9)	Maintenance of Inlet tanks - Wash all Inlet tanks at latest 3 times with DI water - Fill all Inlet tanks with fresh solutions - Wash the "DI water" bottle and fill it with fresh "DI water" (if the EC module is installed)	☒
Remarks:		
10)	Switch on Instrument and software	☒
11)	Workplans backup (delete archived workplans in order to lighten the database)	☒
12)	Mechanical checking and adjustments - Alignment between reactions plate and photometer - Alignment between washing station and reactions plate - Home position of all sampling arms - Alignment of Samples arm on sample carousels and reactions plate - Alignment of Reagents arm on reagents plate and reactions plate - Alignment of Mixer scoops on reactions plate	☒

PAGE 7 OF 12

Remarks: The needle of R1 Reagent Sampling probe is bent then we have adjusted the R1 Reagent Sampling Arm for the needle position is in center of the Washing well.		
13)	Functional checks of the drain lines - Washing well of Samples arm - Manually fill the washing well - Access diagnostic area ("Maintenance" → "Diagnostic") and open the "Samples arm (S)" page - Activate the "Washing well empty pump (P20)" and verify that washing well has been emptied	☒
	Washing well Reagents arm R1 - Manually fill the washing well - Access diagnostic area ("Maintenance" → "Diagnostic") and open the "Reagents arm 1 (R1)" page - Activate the "Washing well empty pump (P21)" and verify that washing well is emptied	☒
	Washing well Reagents arm R2 - Manually fill washing the well - Access diagnostic area ("Maintenance" → "Diagnostic") and open the "Reagents arm 2 (R2)" page - Activate the "Washing well empty pump (P22)" and verify that washing well is emptied	☒
	Washing wells Mixer - Manually fill both washing wells - Access diagnostic area ("Maintenance" → "Diagnostic") and open the "Mixer (MX)" page - Activate the "Scoop 1 washing well empty pump (P19)" and verify that washing well is emptied - Activate the "Scoop 2 washing well empty pump (P18)" and verify that washing well is emptied	☒

PAGE 8 OF 12

	Washing station - cannulas - Access diagnostic area ("Maintenance" → "Diagnostic") - Perform the mechanical reset of the instrument ("Main" page → "Home all motors") - Manually fill the 4 cuvettes located below the cannulas - Open the "Washing station (WS)" page and activate the "Probe 1 empty...", "Probe 2 empty...", "Probe 3 empty..." and "Probe 4 empty..." - Set "Movement length (mm)" to 10 mm and click on "Move down" till the cannulas will be near to the bottom of cuvettes and check that the cuvettes have been emptied - Disable all empty pumps and click on "Reset" to perform the mechanical reset of the washing station	☒
	EC module (if installed) - Access diagnostic area ("Maintenance" → "Diagnostic") - Manually fill the washing well of the EC module - Open the "EC" page; click on "Maintenance" button and check that washing well have been emptied	☐
	NO3 module (if installed) - Access diagnostic area ("Maintenance" → "Diagnostic") - Manually fill the washing well of the NO3 module - Open the "NO3" page; click on "Activate pump P2" button and check that washing well have been emptied	
	Remarks: EC module don't installed. Customer stop to use NO3 module because the Cadmium Cold was defective.	
14)	Prime the hydraulic circuit of the instrument - Insert tubings inside relative Inlet tanks - Perform 2 "Prime liquids" and 1 "Wash all cuvettes"	☒
15)	Washing station - hydraulic operating check - Access "Diagnostic" area and click on "Home all motor" - Open the "Washing station (WS)" page and perform the "Liquid level diagnosis"	☒
Remarks:		

PAGE 9 OF 12

16)	Samples arm - hydraulic operating check - Access "Diagnostic" area and click on "Home all motor" - Open the "Samples arm" page and perform at least 2 times the "Hydraulic check"	☒
Remarks:		
17)	Reagent arm 1 - hydraulic operating check - Access "Diagnostic" area and click on "Home all motor" - Open the "Reagent arm 1" page and perform at least 2 times the "Hydraulic check"	☒
Remarks:		
18)	Reagent arm 2 - hydraulic operating check - Access "Diagnostic" area and click on "Home all motor" - Open the "Reagent arm 2" page and perform at least 2 times the "Hydraulic check"	☒
Remarks:		
19)	Wash and Prime the hydraulic circuit of the instrument - Insert the cannulas inside a beaker with washing solution (5% HCl or sodium hypochlorite 5%) - Perform 2 "Prime liquids" checking that all tubes are filled - Wait for fifteen minutes. - Clean and dry the four cannulas and then insert them into a bottle containing distilled water - Perform 4 "prime liquids" to remove any trace of washing solution - Clean and dry the four cannulas and then insert them inside the relative tanks - Perform 2 "Prime liquids" in order to fill each line with the working solutions	☒
Remarks:		

PAGE 10 OF 12

20)	Prime the hydraulic circuit of the EC module (if installed) ➢ Insert the cannulas inside the DI tank ➢ Perform at least 3 "Purge"	☐
21)	Prime the hydraulic circuit of the NO3 module (if installed) ➢ Insert the cannula into the "Imidazole" bottle ➢ Perform at least 2 "Liquids Prime"	☐
22)	Cuvettes replacement and reset of WBL results ➢ Access diagnostic area ("Maintenance" → "Diagnostic") ➢ Click on "Disengage all motor" in order to be able to move the reactions plate freely by hand ➢ Replace all cuvettes ➢ Access the WBL page ("Checks" → "Water blank level") ➢ Click in the center of the reactions plate picture on the screen and select the "Replace cuvettes" feature to reset WBL results	☒
23)	Drying pad replacement Customer have replaced the Drying pad before.	☒

24)	Photometer checking and adjustment ➢ Replacement of the lamp ➢ Checking and adjustment of Lamp voltage (5,8 V) • Voltage: ➢ Checking and adjustment of Offset (750 counts) and Gain (7,500,000 counts) for each wavelength • Access "Diagnostic" area and click on "Home all motor" • Manually fill cuvette #1, which is in front of the spectrometer, with at least 300 µL of Rinse solution • Open the "Spectrometer" page and click on "Lamp on" in order to switch off the lamp • Setup the Offset at 750 counts for each wavelength • Click on "Lamp on" in order to switch on the lamp and wait the end of the lamp warm-up time "Warm-up (remaining time)" • Setup the Gain at 7,500,000 counts for each wavelength	☒
25)	Temperature ➢ Reaction plate: 36.7 °C ➢ Reagents plate: 8.4 °C ➢ Sampling arm: 22.6 °C ➢ Room: 23.5 °C	☒
1)	Run calibration and quality controls to confirm correct performance Method name: ☒ Pass ☐ Fail ☒ Printout enclosed Method name: ☒ Pass ☐ Fail ☒ Printout enclosed Method name: ☒ Pass ☐ Fail ☒ Printout enclosed Remarks: The calibration and quality controls done by the user which have that document.	☒

Maintenance completed successfully: ☒ Yes ☐ No

Service engineer signature: 



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000 FAX. 0-2719-9484

Certificate of Testing

Cert.No.: 25TW233
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : Mettler Toledo
Model : Seven2GO S9
Serial No. : C326403346
ID No. : CHM_FS0122
Received Date : 12 November 2025
Test Date : 13 November 2025
Reference : 2511-0315DSC-4
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

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

Tested by : Walalak Sirinthean
Approved by : 
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai

REVIEW BY 

APPROVED BY 

NEXT CAL DATE: 13/11/26



Cert.No.: 25TW233
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This measurement result is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	ID No.	Certificate No.	Due Date
1. Burette	130BU10	25CG1126	18 Mar 2027
2. Balance	110RC001	25MM316	02 July 2026

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 1030400

Titration Method (Azide Modification Method)	DO Meter Reading	Standard Deviation
(mg/L)	(mg/L)	(mg/L)
8.20	8.25	0.0045

This report was certified only for the instrument we tested. It is allowable to use for study
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



Certificate of Calibration

Cert. No.: 25LM169
Page.: 1 of 2

Equipment : DO Metter with Sensor
Manufacturer : Mettler Toledo
Model : Seven2GO S9
Serial No. : C326403346
ID No. : CHM_FS0122
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 12 November 2025
Calibrated Date : 14 November 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Kunchit Promprat

Approved by :

() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Suwit Imjai

Issue Date : 18 November 2025

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : DO Metter with Sensor
Condition As-Received : Used Item
Reference : 2511-0315DSC-5
Procedure Used :-

Cert. No.: 25LM169
Page.: 2 of 2

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Digital Thermometer	A52847	2511139	TPA	23 Oct 2026

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

3. This measurement result is traceable to the International System of Unit maintained through :

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 1030400

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	90	20.004	20.1	0.096	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 %.

-000-



Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260
Bangkok Tel : +668 9205 6851 , +669 81924 0059
Saraburi Tel : +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T251785

Certificate of Calibration

Page 1 of 3

Equipment : Chamber (Oven)
Manufacturer : Memmert
Model : UF110
Serial No. : B423.1549
Customer Code : BKK_EN0425
ID No. : T4671A5
Customer : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Oven Room
Date of Receipt : 1 October 2025
Calibrated By : Sujjar Naknakred (Site Calibration Manager)
Approved By : Boonchai Suriyawong (Site Calibration Manager)
Date of Issue : 10 OCT 2025

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.



Metrology Center
SCI ECO Services Company Limited
51 Moo 8, Tubkwang, Kaeng Khoi, Saraburi, Thailand 18260



Certificate No. T251785

Page 2 of 3

Calibration Report

Equipment : Chamber (Oven)
Date of Calibration : 6 October 2025
Environment : Temperature : 24.4-25.8 °C
Line Voltage : 220.5-225.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2019) and AS2853-1986).
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	23-(CH1-10)	T250314	6 April 2026
DATA LOGGER	34970A	T195	T250314	6 April 2026

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.

4. Condition of calibrated item : good

Equipment Description :

Time Constant 2 Hour 14 Minute At 104 °C

Fresh Air Damper ☒ Open ☒ Min ☐ Medium ☐ Max

☐ Close

☐ Not Available

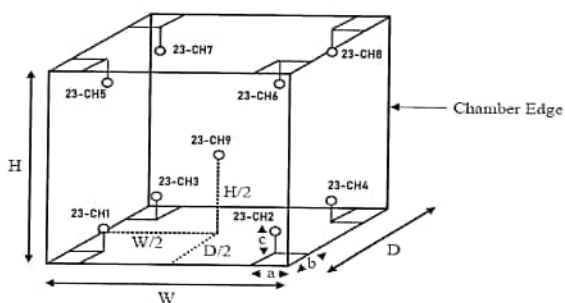
5. Adjustment :

() without adjustment

(X) after adjustment

Approved By :

Calibration Report



Remark : Internal Dimensions of Chamber : W (Width) = 56 cm, H (Height) = 48 cm, and D (Depth) = 40 cm.
Size of installed Standard sensor number 23-CH1 to number 23-CH6 : a = 5 cm, b = 5 cm, and c = 5 cm.
Size of installed Standard sensor number 23-CH9 : W/2 = 56 cm/2, H/2 = 48 cm/2 and D/2 = 40 cm/2

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)								
	23-CH1	23-CH2	23-CH3	23-CH4	23-CH5	23-CH6	23-CH7	23-CH8	23-CH9
104	104.13	103.54	103.92	104.37	104.40	104.51	104.18	103.86	103.80
180	180.05	179.82	179.64	179.52	181.20	180.29	180.19	179.35	179.85

Chamber (Oven)		Temperature Distribution					
Setting °C	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min, Max	Average					
104.0	-	104.0	104.08	0.28	0.87	0.45	2.00
180.0	180.0, 180.1	180.0	179.99	0.37	1.49	0.61	2.00

* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95%.

End of Certificate.

Approved By.

FM-TL07 102/27-03-68

Calibration Report

Equipment : Digestion Unit
Date of Calibration : 2 March 2026
Environment : Temperature : 23.9 - 26.3 °C
Line Voltage : 221.8 - 225.9 V
Relative Humidity : 55 - 65 % RH

Condition of this results of calibration :

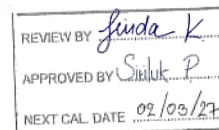
- This equipment was calibrated by insert four standard thermocouples type S into its chamber, the other one thermocouple type T use for ambient temperature measurement. The calibration was done in according to WI-T10.
All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.
- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	Type S	M15-(C111-C114)	T250749	14 May 2026
DATA LOGGER	34970A	T193	T250749	14 May 2026
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244)
- Condition of calibrated item : good
Equipment Description :
Time Constant ☒ 2 Hour ☐ 40 Minute At 380 °C
Fresh Air Dumper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment :
(X) without adjustment () after adjustment

Approved By.

FM-TL05 102/27-03-68

Equipment : Digestion Unit
Manufacturer : SCP Science
Model : DigiPRER HT
Serial No. : HTC1120480658
Customer Code : BKK_EN0366
ID No. : T2635A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.



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

Customer Location : Wet Chemistry Lab I

Date of Receipt : 25 February 2026

Calibrated By : Atiphong Rongrat (Technician)

Approved By : / Boonchai Suriyawong (Site Calibration Manager)

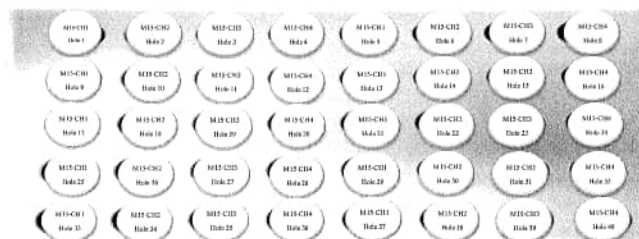
Date of Issue : 05 MAY 2026

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-TL04 102/27-03-68

Calibration Report



FRONT

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
				Reading	M15-CH1 Std.1	M15-CH2 Std.2	M15-CH3 Std.3	M15-CH4 Std.4	M15-CH5 Std.5	M15-CH6 Std.6	M15-CH7 Std.7
380.0	380.0	379.8 - 380.2	Max °C	379.9	380.7	380.9	381.1	381.3	381.5	380.5	379.5
			Min °C	379.5	380.3	380.5	380.7	381.0	381.1	380.2	379.7
			Average °C	379.7	380.5	380.7	380.9	381.2	381.3	380.4	379.4
			Stability ± °C	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
				Reading	M15-CH1 Std.1	M15-CH2 Std.2	M15-CH3 Std.3	M15-CH4 Std.4	M15-CH5 Std.5	M15-CH6 Std.6	M15-CH7 Std.7
380.0	380.0	379.8 - 380.2	Max °C	380.1	380.3	380.6	381.1	380.4	380.6	380.3	380.7
			Min °C	379.6	379.8	380.2	380.6	380.1	380.2	379.7	380.4
			Average °C	379.8	380.1	380.4	380.9	380.3	380.4	380.0	380.5
			Stability ± °C	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.2

Approved By.

FM-TL05 102/27-03-68

Calibration Report

Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-CB1 Block 17	M15-CB2 Block 18	M15-CB3 Block 19	M15-CB4 Block 20	M15-CB1 Block 21	M15-CB2 Block 22	M15-CB3 Block 23	M15-CB4 Block 24
380.0	380.0	379.8 ~ 380.2	Max °C	383.0	380.6	380.7	381.2	380.0	380.6	379.3	381.0
			Min °C	382.4	379.8	380.1	380.6	379.3	380.1	378.8	380.5
			Average °C	382.7	380.2	380.4	380.9	379.6	380.4	379.1	380.7
			Stability ± °C	0.3	0.4	0.3	0.3	0.3	0.2	0.3	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-CB1 Block 25	M15-CB2 Block 26	M15-CB3 Block 27	M15-CB4 Block 28	M15-CB1 Block 29	M15-CB2 Block 30	M15-CB3 Block 31	M15-CB4 Block 32
380.0	380.0	379.8 ~ 380.2	Max °C	381.3	380.1	380.6	381.4	380.9	381.3	379.9	380.6
			Min °C	381.0	379.7	380.1	380.9	380.5	380.8	379.3	380.2
			Average °C	381.1	379.9	380.3	381.2	380.7	381.0	379.6	380.4
			Stability ± °C	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.2

Cal. Point	Setting	Reading	STD.	Position of Standards at Block							
(°C)	(°C)	(°C)	Reading	M15-CB1 Block 33	M15-CB2 Block 34	M15-CB3 Block 35	M15-CB4 Block 36	M15-CB1 Block 37	M15-CB2 Block 38	M15-CB3 Block 39	M15-CB4 Block 40
380.0	380.0	379.8 ~ 380.2	Max °C	381.3	383.0	383.2	382.3	380.7	380.3	380.2	381.0
			Min °C	380.9	382.4	382.9	381.9	379.9	380.0	379.8	380.7
			Average °C	381.1	382.7	383.0	382.1	380.0	380.2	380.0	380.8
			Stability ± °C	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.3

The expanded uncertainty of temperature measurement was ± 1.68 °C

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing

a level of confidence of approximately 95 %.

Approved By: 