

เอกสารแนบ จ

เอกสารการสอบเทียบเครื่องมือตรวจวัด

เอกสารการสอบเทียบเครื่องมือตรวจวัด
บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

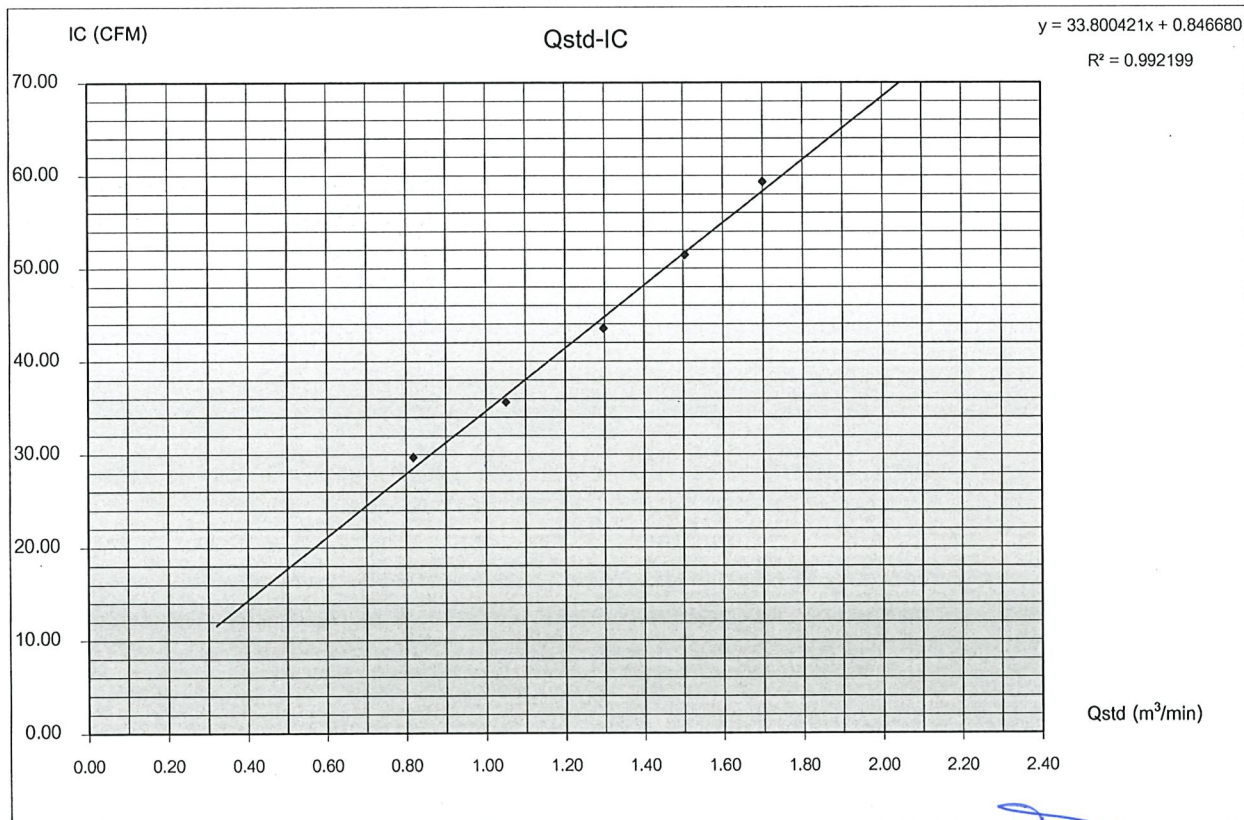
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	April 18, 2022
บ้านพักอาศัยด้านทิศเหนือของพื้นที่โครงการ				Start Time	12:13 PM
Sampler Number	TSP No.A24	Transfer Standard Type	Orifice	Stop Time	12:23 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Prayun Detkla
Motor Serial Number	2151	Calibrator Serial Number	3362		
Recorder Serial Number	2412				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	sample Flow Rate Indication (ft ³ /min)	IC = $\{[(Pa/P_{std})(T_{std}/Ta)]^{1/2}\}$	(*K = °C+273)	Pressure (mmHg)	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	1.4	1.4	2.8	1.65508	0.81877	30.0	29.67	303.0	756.0		
7	2.3	2.3	4.6	2.12139	1.05079	36.0	35.61	303.0	756.0		
10	3.5	3.5	7.0	2.61692	1.29735	44.0	43.52	303.0	756.0		
13	4.7	4.7	9.4	3.03253	1.50414	52.0	51.43	303.0	756.0		
18	6.0	6.0	12.0	3.42635	1.70009	60.0	59.35	303.0	756.0		
Linear Regression Y ON X: Y= mX + b							Average	303.0	756.0		
1	Slope (m)			2.00980	Linear Equation			r ²	0.992199	Pstd(mmHg)	760.0
2	Intercept (b)			0.00951	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9960919	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.978322043	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.989101634	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

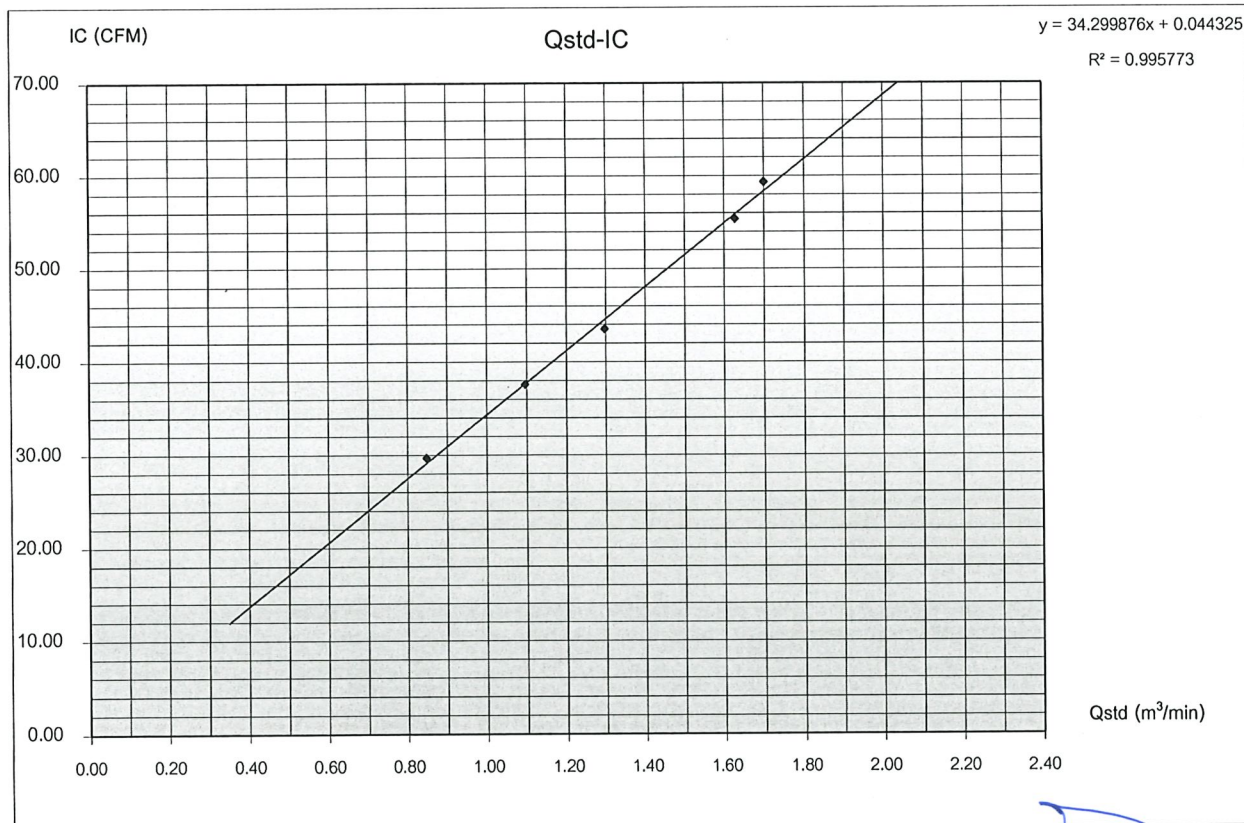
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	April 18, 2022
บริเวณบ้านบางชัน หมู่ที่ 8 ตำบลไชยภูมิ				Start Time	11:12 AM
Sampler Number	TSP No.A10	Transfer Standard Type	Onlice	Stop Time	11:22 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Prayun Detkla
Motor Serial Number	2012-04	Calibrator Serial Number	3362		
Recorder Serial Number	1504				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	sample Flow Rate Indication (ft ³ /min)	IC = $\{[(Pa/P_{std})(T_{std}/Ta)]^{1/2}\}$	(*K = °C+273)	Pressure (mmHg)	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	1.5	1.5	3.0	1.71317	0.84768	30.0	29.67	303.0	756.0		
7	2.5	2.5	5.0	2.21170	1.09573	38.0	37.59	303.0	756.0		
10	3.5	3.5	7.0	2.61692	1.29735	44.0	43.52	303.0	756.0		
13	5.5	5.5	11.0	3.28048	1.62751	56.0	55.39	303.0	756.0		
18	6.0	6.0	12.0	3.42635	1.70009	60.0	59.35	303.0	756.0		
Linear Regression Y ON X : Y= mX + b							Average	303.0	756.0		
1	Slope (m)			2.00980	Linear Equation			r ²	0.995773	Pstd(mmHg)	760.0
2	Intercept (b)			0.00951	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9978843	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.978322043
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.989101634

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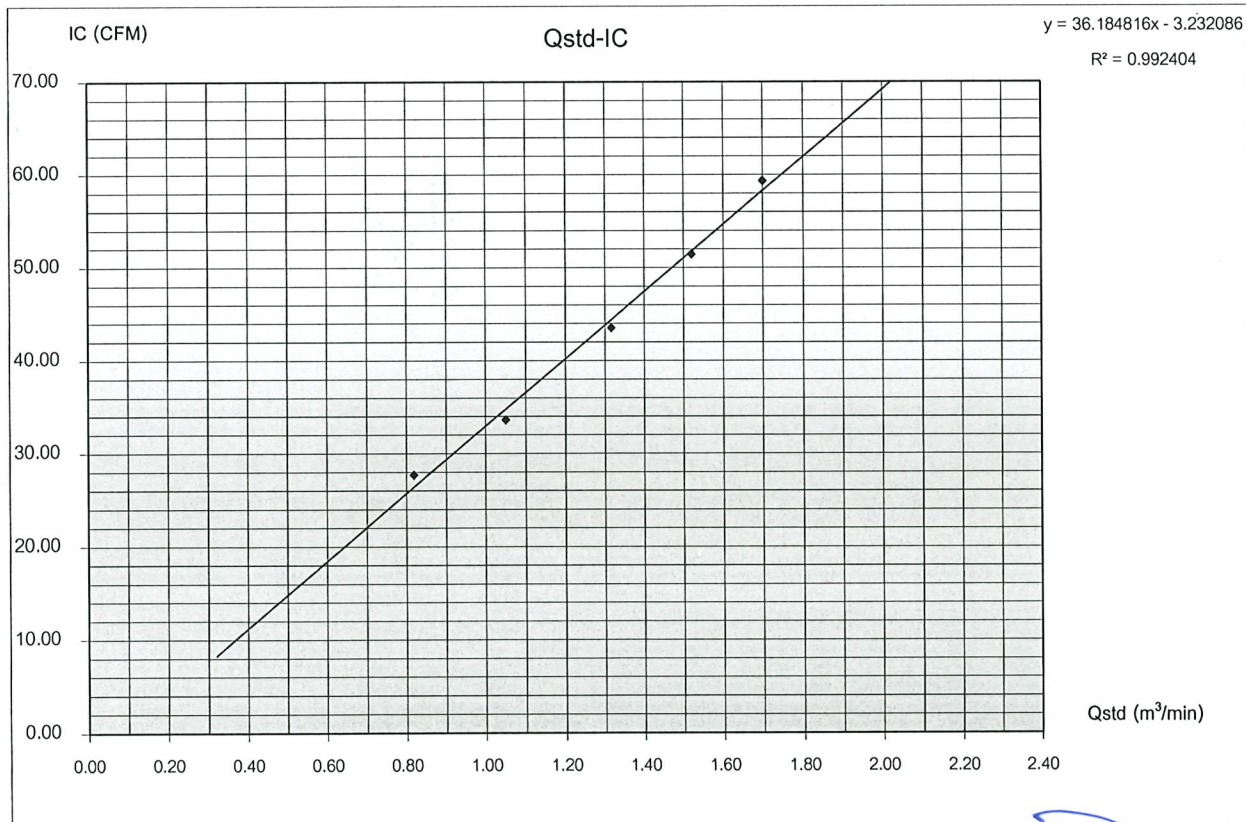
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	April 18, 2022
บริเวณวัดบ้านป่า หมู่ที่ 2 ตำบลศรีณรงค์				Start Time	1:06 PM
Sampler Number	TSP No.A11	Transfer Standard Type	Orifice	Stop Time	1:16 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Prayun Detkla
Motor Serial Number	610-650	Calibrator Serial Number	3362		
Recorder Serial Number	102930701				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
No.	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)] (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(*K = °C+273)	Pressure (mmHg)	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	1.4	1.4	2.8	1.65508	0.81877	28.0	27.69	303.0	756.0		
7	2.3	2.3	4.6	2.12139	1.05079	34.0	33.63	303.0	756.0		
10	3.6	3.6	7.2	2.65404	1.31582	44.0	43.52	303.0	756.0		
13	4.8	4.8	9.6	3.06462	1.52011	52.0	51.43	303.0	756.0		
18	6.0	6.0	12.0	3.42635	1.70009	60.0	59.35	303.0	756.0		
Linear Regression Y ON X : Y= mX + b							Average	303.0	756.0		
1	Slope (m)			2.00980	Linear Equation			r ²	0.992404	Pstd(mmHg)	760.0
2	Intercept (b)			0.00951	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9961948	T _{RTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.978322043	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.989101634	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

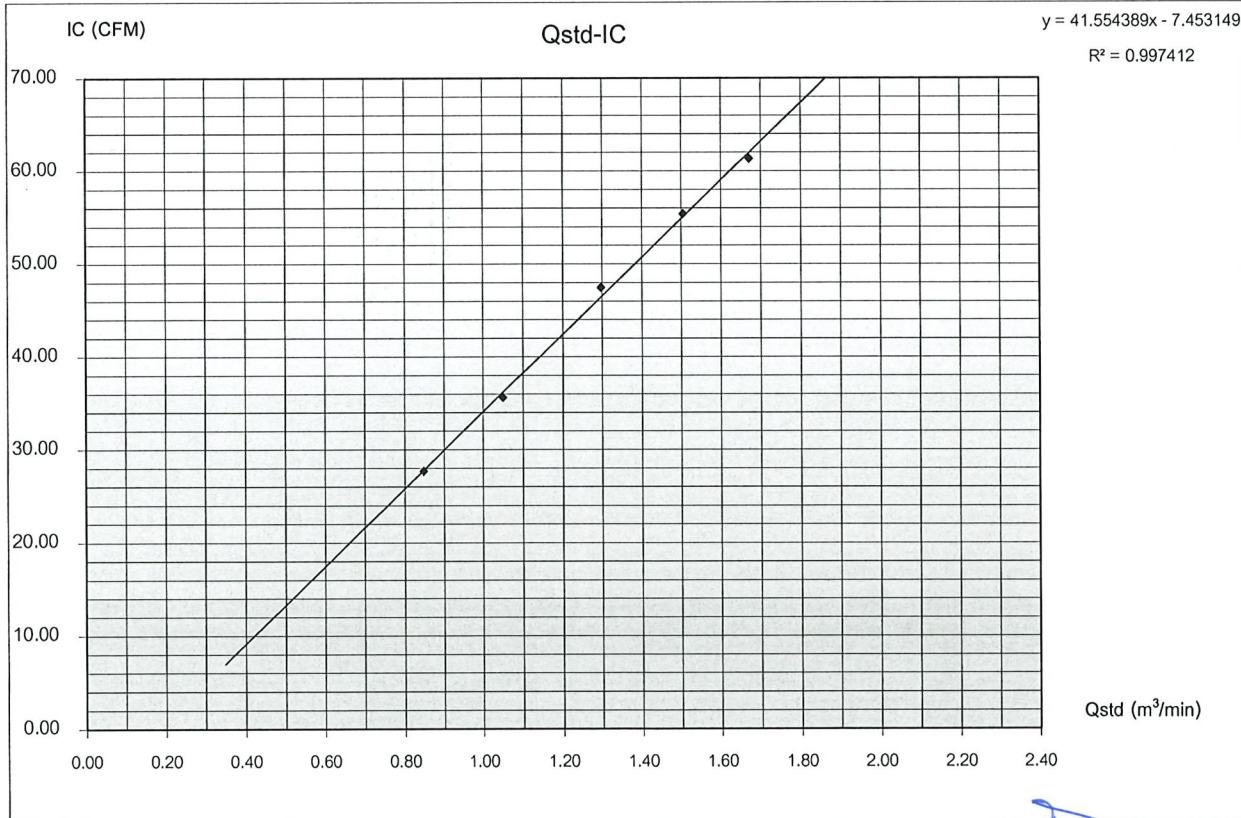
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	April 18, 2022
บริเวณวัดดอนกระต่ายทอง หมู่ที่ 5				Start Time	9:48 AM
Sampler Number	TSP No.A21	Transfer Standard Type	Onifice	Stop Time	9:58 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Prayun Detkla
Motor Serial Number	2216	Calibrator Serial Number	3362		
Recorder Serial Number	2398				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
No.	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)] (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(°K = °C+273)	Pressure (mmHg)	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	1.5	1.5	3.0	1.71317	0.84768	28.0	27.69	303.0	756.0		
7	2.3	2.3	4.6	2.12139	1.05079	36.0	35.61	303.0	756.0		
10	3.5	3.5	7.0	2.61692	1.29735	48.0	47.48	303.0	756.0		
13	4.7	4.7	9.4	3.03253	1.50414	56.0	55.39	303.0	756.0		
18	5.8	5.8	11.6	3.36876	1.67143	62.0	61.32	303.0	756.0		
Linear Regression Y ON X : Y= mX + b							Average	303.0	756.0		
1	Slope (m)			2.00980	Linear Equation			r ²	0.997412	Pstd(mmHg)	760.0
2	Intercept (b)			0.00951	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9987052	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.978322043	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.989101634	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

Certificate of Calibration

Calibration Certification Information

Cal. Date: July 26, 2021	Rootsmeter S/N: 438320	Ta: 297 °K
Operator: Jim Tisch		Pa: 749.3 mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 3362	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4180	3.2	2.00
2	3	4	1	0.9940	6.4	4.00
3	5	6	1	0.8890	8.0	5.00
4	7	8	1	0.8460	8.8	5.50
5	9	10	1	0.6970	12.8	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9850	0.6947	1.4066	0.9957	0.7022	0.8904
0.9808	0.9867	1.9892	0.9915	0.9974	1.2592
0.9787	1.1009	2.2240	0.9893	1.1128	1.4078
0.9776	1.1556	2.3326	0.9883	1.1682	1.4765
0.9723	1.3950	2.8132	0.9829	1.4102	1.7807
QSTD	m=	2.00980	QA	m=	1.25850
	b=	0.00951		b=	0.00602
	r=	0.99999		r=	0.99999

Calculations

Vstd=	$\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$	Va=	$\Delta Vol((Pa-\Delta P)/Pa)$
Qstd=	$Vstd/\Delta Time$	Qa=	$Va/\Delta Time$
For subsequent flow rate calculations:			
Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$		Qa= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$	

Standard Conditions

Tstd: 298.15 °K

Pstd: 760 mm Hg

Key

ΔH: calibrator manometer reading (in H2O)

ΔP: rootsmeter manometer reading (mm Hg)

Ta: actual absolute temperature (°K)

Pa: actual barometric pressure (mm Hg)

b: intercept

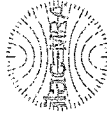
m: slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



PLAY SOLUTION TECHNOLOGY COMPANY LIMITED
179/75 Nawong Pracha Pattana Road, Sikan, Donmuang, Bangkok 10210
Tel:+66 2 011 0505, Fax:+66 2 010 7700
www.playsotec.com



CERTIFICATE OF CALIBRATION

Customer : ENVIRONMENT RESEARCH & TECHNOLOGY CO.,LTD.
Certificate no. PST-0001-22
Page no. 1 of 3

Company : 25/114 Moo 6 Soi Chinakhet 1, Ngamwongwan Road, Toongsongkhong,
Address :
City / Province : Laksi, Bangkok
Zip/Postal : 10210

Device

Equipment : Electronic Balance Capacity : 220 g
Manufacturer : METTLER TOLEDO Readability : 0.0001 g
Model : AB204-S ID No. : ERTC-L-In-0048
Serial No. : 1123103723

Environment Conditions

Location of Calibration : Calibration Laboratory at Play Solution Technology Co.,Ltd
Ambient Temperature : 25.9 (°C)
Relative Humidity : 53.1 (%RH)
Barometric Pressure : 1011.5 (mbar)
Calibration Procedure : This Calibration was conducted by using In-House calibration procedure number CP-M-001 base on "UKAS LAB 14"
Comment :

Date of Receipt : January 4, 2022

Date of Calibration : January 4, 2022

Issue Date : January 4, 2022

Calibrated by : Kittichai R. (Kittichai Rattanatham) Approved by : Kittichai R. (Kittichai Rattanatham)
Calibrator Approved Signature

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

This Certificate is issued in accordance with the conditions of accreditation granted by Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and is traceability to recognize national standards and to the unit 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 approval of

the calibration center, Play Solution Technology Co.,Ltd



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179/75 Nawong Pracha Pattana Road, Sikan, Donmuang, Bangkok 10210
Tel:+66 2 011 0505, Fax:+66 2 010 7700
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CERTIFICATE OF CALIBRATION

Result of Calibration : Without Adjustment
Certificate no. PST-0001-22
Page no. 2 of 3

1. Repeatability

Weighting Rang 1	(g)	Nominal Value	(g)	Standard Deviation	(g)
Max.capacity	220	200		0.00005	
Weighting Rang 2	(g)	Nominal Value	(g)	Standard Deviation	(g)
Max.capacity					

2.Linearity, Departure of Indication from nominal value

Weighting Range 1

Nominal Value	Standard Value	Indication	Error of Indication	Expanded Uncertainty	Factor k
(g)	(g)	(g)	(g)	(g)	
0.001	0.00100	0.0010	0.0000	0.00011	2.07
0.01	0.01000	0.0100	0.0000	0.00011	2.07
0.1	0.10001	0.1000	0.0000	0.00011	2.07
1	1.00001	1.0000	0.0000	0.00011	2.06
5	5.00002	5.0000	0.0000	0.00011	2.06
10	10.00001	10.0000	0.0000	0.00011	2.05
50	50.00003	50.0000	0.0000	0.00013	2.03
100	100.00004	100.0001	0.0001	0.00018	2.00
150	150.00007	150.0001	0.0000	0.00024	2.00
200	200.00006	200.0002	0.0001	0.00031	2.00

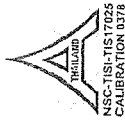
Weighting Range 2

Nominal Value	Standard Value	Indication	Error of Indication	Expanded Uncertainty	Factor k
(g)	(g)	(g)	(g)	(g)	

The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by cover factor k as per listed in table above, which corresponds to a confidence level of about 95%



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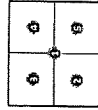
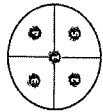
CERTIFICATE OF CALIBRATION

Result of Calibration

Certificate no. PST-0001-22
Page no. 3 of 3

3. Eccentricity

Test load at least 1/3 of the maximum capacity, typically placed between 1/2 and 1/3 of the distance from the centre of the load receptor to the edge.



Weighing Range 1
Test Load : 100 (g)

Position	Indication (g)
1	100.0001
2	100.0001
3	100.0002
4	100.0001
5	100.0002
Max.Deviation	0.0001

Weighing Range 2

Test Load : (g)

Position	Indication (g)
Max.Deviation	

Standard method

The calibration was performed by using calibration laboratory's in-house calibration method : CP-M-001 based on "UKAS LAB 14 : Calibration of weighing machine" : edition 6 | October 2019

Reference standards instrument

Instrument	QIML Class	S/N	Certificate No.	Due Date
Standard Weight Set	E2	4000021952	MM-0183-20	December 8, 2022
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-

Measurement Uncertainty

The given measurement uncertainty is the standard of the measurement multiplied by an extension factor k which corresponds to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to M3003

Traceability :

- The measurement is traceable to national standard, which realize the physical unit of measurement (SI)
- National Institute of Metrology (Thailand) through Calibration Laboratory

END OF REPORT

Calibration Data of NOx Analyzer

Analyzer Performance Test

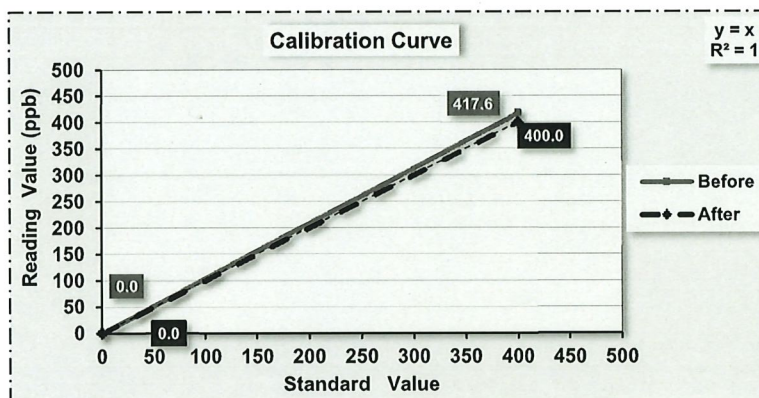
Equipment	Gas Analyzer (NOx)	Customer Name	โพธิ์เกียรติ์ คอนซัลแตนต์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Scientist	Panupon
Serial No.	NGABK8F2	Calibration Date	April 12, 2022
Analyzer Unit	ppb	Time	10:54 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.2	0.0	0.0	0.0	-0.2	0.0	-	-	-
Span	400	416.3	400.0	417.6	400.0	-1.3	0.0	-	-	4.4



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.4	0.5	Voltage of the measured NO value
Signal NOx	mV	4.0	4.4	Voltage of the measured NOx value
Detector	°C	40.3	40.4	43 °C ± 5 °C
Ambient	kPa	100.7	100.8	Current atmospheric pressure
DC 24V	V	23.6	23.6	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.71380	1.45760	0.50000 - 2.0000
NOx Slope	-	1.59250	1.40500	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)

April 12, 2022



Checked By :

(MS.SUTATIP IM-NOI)

April 12, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

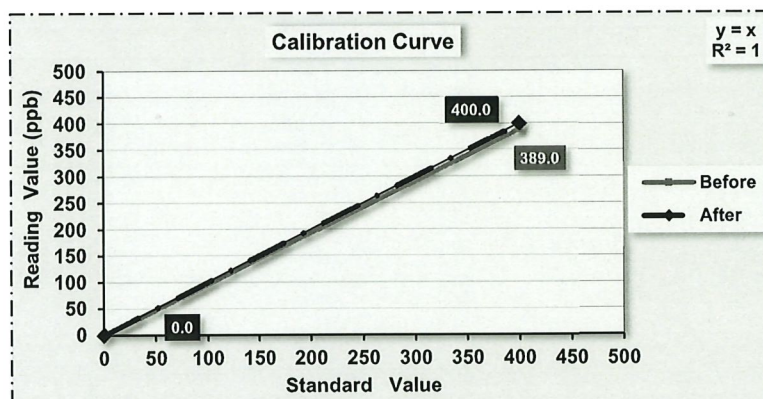
Equipment	Gas Analyzer (NOx)	Customer Name	โพธิ์เพียร คอนซัลแตนต์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Scientist	Panupon
Serial No.	AX7HSME0	Calibration Date	April 12, 2022
Analyzer Unit	ppb	Time	11:49 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-5.0	0.0	-0.9	0.0	-4.1	0.0	-	-	-
Span	400	376.7	400.0	389.0	400.0	-12.3	0.0	-	-	2.8



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.2	0.3	Voltage of the measured NO value
Signal NOx	mV	11.1	11.2	Voltage of the measured NOx value
Detector	°C	40.6	40.6	43 °C ± 5 °C
Ambient	kPa	101.0	100.9	Current atmospheric pressure
DC 24V	V	23.5	23.5	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	0.77960	0.97730	0.50000 - 2.0000
NOx Slope	-	0.75770	0.98700	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
April 12, 2022



Checked By :

(MS.SUTATIP IM-NOI)
April 12, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

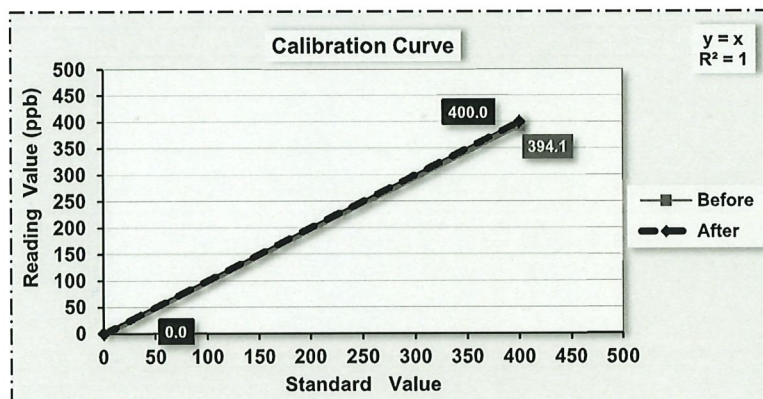
Equipment	Gas Analyzer (NOx)	Customer Name	โพธิ์เกียรติ์ คอนซัลแตนต์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Scientist	Panupon
Serial No.	KCDVY226	Calibration Date	April 10, 2022
Analyzer Unit	ppb	Time	1:14 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.7	0.0	-0.7	0.0	0.0	0.0	-	-	-
Span	400	395.2	400.0	394.1	400.0	1.1	0.0	-	-	1.5



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.7	1.0	Voltage of the measured NO value
Signal NOx	mV	12.5	12.0	Voltage of the measured NOx value
Detector	°C	41.2	41.2	43 °C ± 5 °C
Ambient	kPa	100.6	100.6	Current atmospheric pressure
DC 24V	V	23.5	23.5	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	0.90027	0.91745	0.50000 - 2.0000
NOx Slope	-	0.94527	0.95847	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
April 10, 2022



Checked By :

(MS.SUTATIP IM-NOI)
April 10, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

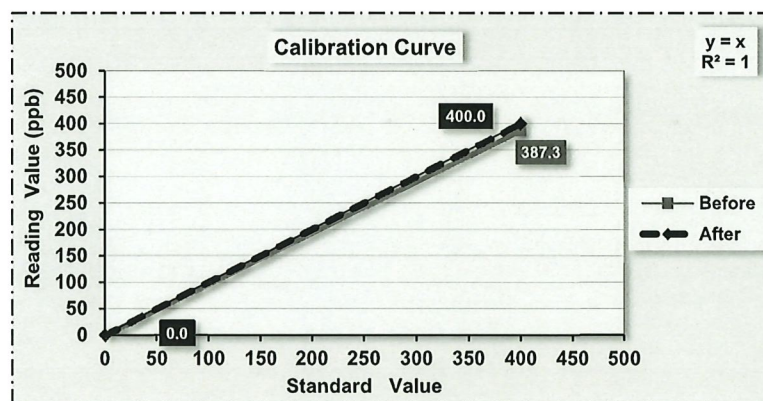
Equipment	Gas Analyzer (NOx)	Customer Name	โพธิ์เตี้ยร์ คอนซัลแตนต์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Scientist	Panupon
Serial No.	A4LUUFHB	Calibration Date	April 12, 2022
Analyzer Unit	ppb	Time	11:36 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.5	0.0	-0.2	0.0	-0.3	0.0	-	-	-
Span	400	387.6	400.0	387.3	400.0	0.3	0.0	-	-	3.2



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	1.9	2.0	Voltage of the measured NO value
Signal NOx	mV	12.3	13.0	Voltage of the measured NOx value
Detector	°C	41.7	41.7	43 °C ± 5 °C
Ambient	kPa	100.3	100.3	Current atmospheric pressure
DC 24V	V	23.8	23.8	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	0.84200	0.95560	0.50000 - 2.0000
NOx Slope	-	0.83740	0.94960	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
April 12, 2022



Checked By :

(MS.SUTATIP IM-NOI)
April 12, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

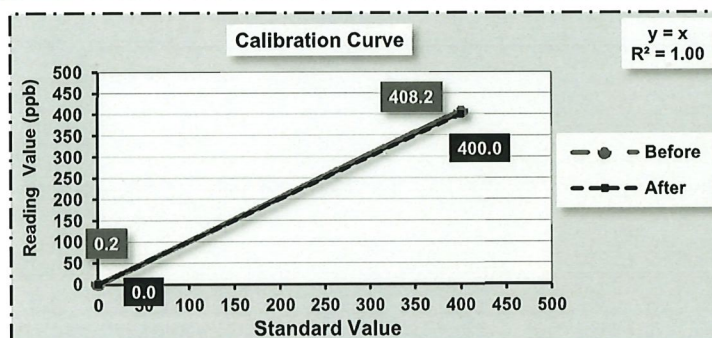
Equipment	Gas Analyzer (SO ₂)	Customer Name	โพธิ์เพชร คอนซัลแตนต์
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Scientist	Panupon
Serial No.	J000EMWB	Calibration Date	April 11, 2022
Analyzer Unit	ppb	Time	11:04 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.2	0.0	-	-	-
Span	400	408.2	400.0	-	-	2.1



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	15.8	17	Voltage of the measured SO ₂ value
LAMP	mV	227.8	228.1	200 mV - 1200 mV
CELL	°C	37.9	38.4	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	44.1	44.1	65 kPa or less
AMBIENT	kPa	101.5	101.5	Current atmospheric pressure
DC 24V	V	24.0	24.0	24 V ±0.5 V
DC 5V	V	4.9	4.9	5 V ±0.5 V

Calibrate By :

(MR.PANUPON PODANG)

April 11, 2022

Checked By :

(MS.SUTATIP IM-NOI)

April 11, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

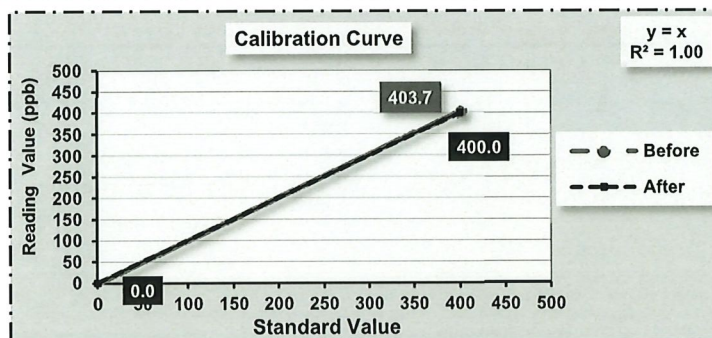
Equipment	Gas Analyzer (SO ₂)	Customer Name	โพธิ์เกียรติ์ คอนซัลแตนต์
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Scientist	Panupon
Serial No.	12E8X34P	Calibration Date	April 11, 2022
Analyzer Unit	ppb	Time	11:13 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	-0.4	0.0	-	-	-
Span	400	403.7	400.0	-	-	0.9



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	3.2	4.3	Voltage of the measured SO ₂ value
LAMP	mV	320.1	316.5	200 mV - 1200 mV
CELL	°C	38.3	38.4	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	44.2	44.3	65 kPa or less
AMBIENT	kPa	100.9	100.9	Current atmospheric pressure
DC 24V	V	23.9	23.9	24 V ±0.5 V
DC 5V	V	4.9	4.9	5 V ±0.5 V

Calibrate By :

(MR.PANUPON PODANG)

April 11, 2022

Checked By :

(MS.SUTATIP IM-NOI)

April 11, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

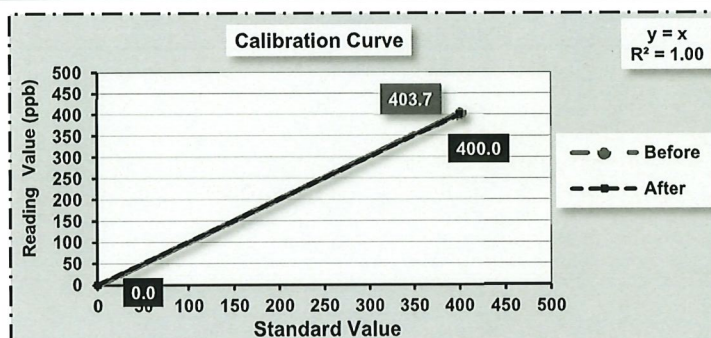
Equipment	Gas Analyzer (SO ₂)	Customer Name	โพธิ์เกียรติ์ คอนซัลแตนต์
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Scientist	Panupon
Serial No.	E5KBWB08	Calibration Date	December 11, 2018
Analyzer Unit	ppb	Time	11:13 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	-0.4	0.0	-	-	-
Span	400	403.7	400.0	-	-	0.9



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	6.2	6.3	Voltage of the measured SO ₂ value
LAMP	mV	240.3	243.9	200 mV - 1200 mV
CELL	°C	30.0	29.2	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	44.0	42.9	65 kPa or less
AMBIENT	kPa	102.0	101.8	Current atmospheric pressure
DC 24V	V	24.0	24.0	24 V ±0.5 V
DC 5V	V	5.0	5.0	5 V ±0.5 V

Calibrate By :

(MR.PANUPON PODANG)
December 11, 2018

Checked By :

(MS.SUTATIP IM-NOI)
December 11, 2018

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

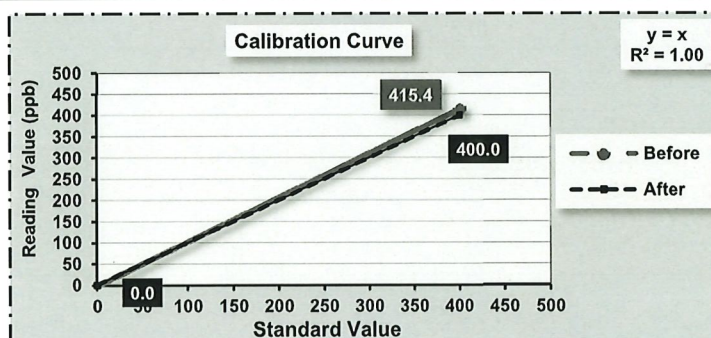
Equipment	Gas Analyzer (SO ₂)	Customer Name	โพธิ์เกียรติ์ คอนซัลแตนต์
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Scientist	Panupon
Serial No.	ETSTKURU	Calibration Date	April 11, 2022
Analyzer Unit	ppb	Time	11:09 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	-1.1	0.0	-	-	-
Span	400	415.4	400.0	-	-	3.8



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	5.5	5.7	Voltage of the measured SO ₂ value
LAMP	mV	259.5	259.5	200 mV - 1200 mV
CELL	°C	35.5	35.9	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	44.5	44.5	65 kPa or less
AMBIENT	kPa	100.8	100.7	Current atmospheric pressure
DC 24V	V	23.9	23.9	24 V ±0.5 V
DC 5V	V	5.0	5.0	5 V ±0.5 V

Calibrate By :

(MR.PANUPON PODANG)

April 11, 2022

Checked By :

(MS.SUTATIP IM-NOI)

April 11, 2022

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0292	Reference Number:	160-401604495-1
Cylinder Number:	EB0123013	Cylinder Volume:	144.4 Cubic Feet
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12019	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Oct 22, 2019

Expiration Date: Oct 22, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	55.00 PPM	55.27 PPM	G1	+/- 0.8% NIST Traceable	10/14/2019, 10/22/2019
NITRIC OXIDE	55.00 PPM	55.27 PPM	G1	+/- 0.8% NIST Traceable	10/14/2019, 10/22/2019
SULFUR DIOXIDE	55.00 PPM	54.93 PPM	G1	+/- 0.9% NIST Traceable	10/14/2019, 10/22/2019
CARBON MONOXIDE	4500 PPM	4516 PPM	G1	+/- 0.6% NIST Traceable	10/14/2019
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13010429	KAL004123	97.6 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jul 23, 2025
NTRM	13010429	KAL004123	97.6 PPM NOx/NITROGEN	+/- 0.8%	Jul 23, 2025
NTRM	16010235	KAL004419	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012318	KAL004620	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTIR - CO - 000928781	FTIR	Sep 26, 2019
MKS FTIR - NO - 000928781	FTIR	Oct 18, 2019
MKS FTIR - NOx - 000928781	FTIR	Oct 18, 2019
MKS FTIR - SO2 - 000928781	FTIR	Oct 03, 2019

Triad Data Available Upon Request

NOTES: Gross Weight: 28.0 Kg, Net Weight: 4.6 Kg.



[Signature]
Approved for Release



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 28 December, 2021

Certification No. 547/21

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WE91016A19 ID No. : No.7

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1014.5 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

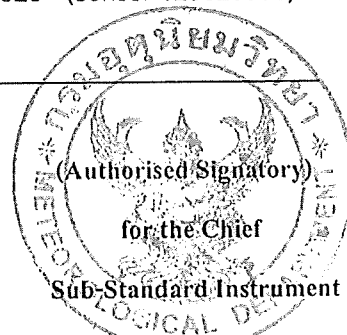
Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Signed :

Mr. Pisood Promsut





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Certification No. 547/21

28 December, 2021

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
	inches H ₂ O	inches H ₂ O	m/sec	m/sec	m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.2	0.82
5.00	-	-	-	4.5	0.50
7.04	-	-	-	6.7	0.34
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.3	0.71
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.1	0.92

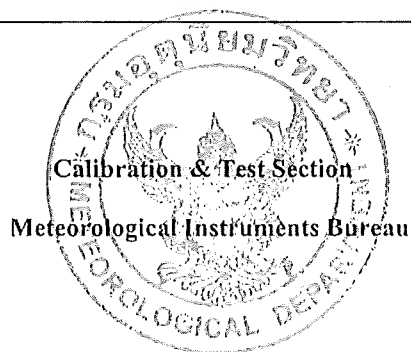
Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 1 September, 2021

Certification No. 450/21

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC21023B64 ID No. : No.6

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1004.8 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Signed :

Mr. Pisood Promsut





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Certification No. 450/21

1 September, 2021

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.04	-	-	-	6.7	0.34
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.2	0.81
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.3	0.71
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.3	0.72

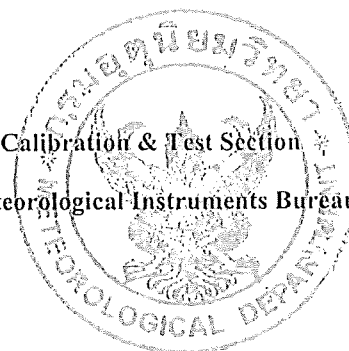
Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRETION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 6 August, 2021

Certification No. 370/21

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC90504A18 ID No. : No.14

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.2 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

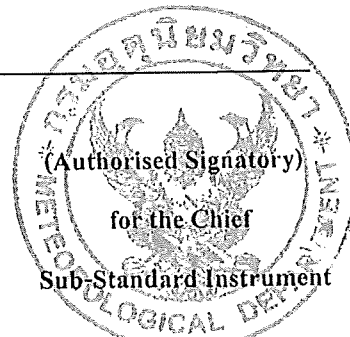
Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Signed :

Mr. Pisood Promsut





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 370/21

6 August, 2021

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches	Vacuum inches	Pressure hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.04	-	-	-	6.3	0.74
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.3	0.71
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.3	0.71
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.3	0.72

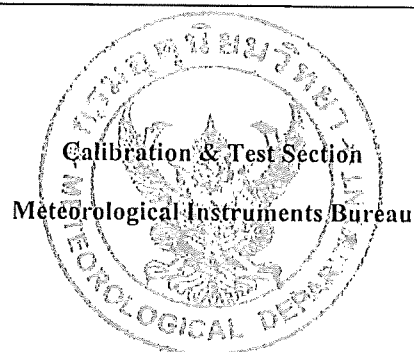
Wind Aloft Plotting Board.	
US. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 6 August, 2021

Certification No. 371/21

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC40801A97 ID No. : No.16

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.3 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

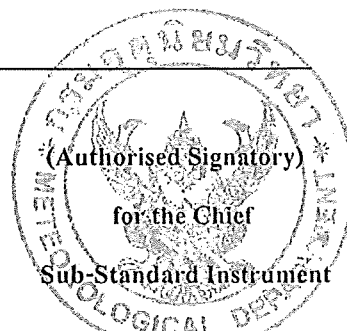
Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Signed :

Mr. Pisood Promsut





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 371/21

6 August, 2021

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches	Vacumm inches	Pressure hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.04	-	-	-	6.7	0.34
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.3	0.71
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.3	0.72

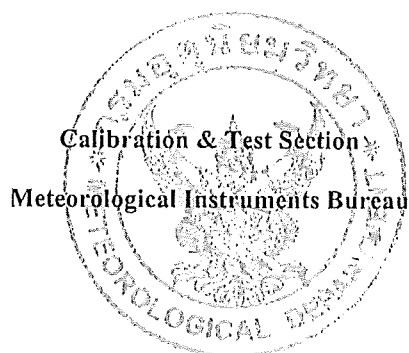
Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRETION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0189

MTC No. EEL. BP. 79/1264

CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co.,Ltd.

Address : 25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description : Sound Level Calibrator

Temperature : $(23 \pm 3) ^\circ\text{C}$

Manufacturer : Rion

Relative Humidity : $(50 \pm 15) \%$

Model : NC-73

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Serial No. : 10876348

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 20 Dec. 2021

Date of Calibration : 4 Jan. 2022

1 / 2

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

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

FM.BL.MTC.002 Rev.4

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office
196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0189

MTC No. EEL. BP. 79/1264

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	94.33	0.33	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	945.9	-54.1	± 1.5	$\pm 1.0\%$

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	2.45	± 0.60	$\pm 3.0\%$

Note : 1. No adjustment.


2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


.....
(Mr. Weerachai Deechaiyae)

Approved by :


.....
(Mr. Prawate Kluaypa)

Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 4 Jan. 2022

Date of Issue : 5 Jan. 2022

Ref : 2011264122005233001

End of Certificate

2 / 2

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

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

METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING REFERENCE METER # WET TEST METER W-NK5A No. 540961
5-POINT METRIC UNIT

Meter Console Information	
Console Model Number	XC-572V
Console Serial Number	0306016
DGM Model Number	SK25EX
DGM Serial Number	0005305

Calibration Conditions			
Date	Time	23-Aug-21	1:00 PM
Calibration Reference No.	GC64APE0039		
Barometric Pressure	756	mm Hg	
Calibration Meter Gamma	0.9980	unitless	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K ₁	0.386	

Calibration Data									
Run Time		Metering Console				Calibration Meter			
Elapsed (t)	DGM Orifice (P ₂)	Volume Initial (V _{1i})	Volume Final (V _{1f})	Outlet Temp Initial (t _{1i})	Outlet Temp Final (t _{1f})	Volume Initial (V _{2i})	Volume Final (V _{2f})	Outlet Temp Initial (t _{2i})	Outlet Temp Final (t _{2f})
min	mm H ₂ O	m ³	m ³	°C	°C	m ³	m ³	°C	°C
15.00	13.0	0.1394	0.3486	27	27	220.39268	220.60147	27	27
10.00	25.0	0.3669	0.5658	27	27	220.61981	220.81889	27	27
8.00	50.0	0.6002	0.8191	27	27	220.85357	221.07311	27	27
7.00	80.0	0.8472	1.0854	27	27	221.10196	221.34195	27	27
5.00	120.0	1.1244	1.3330	27	27	221.38124	221.59250	27	27

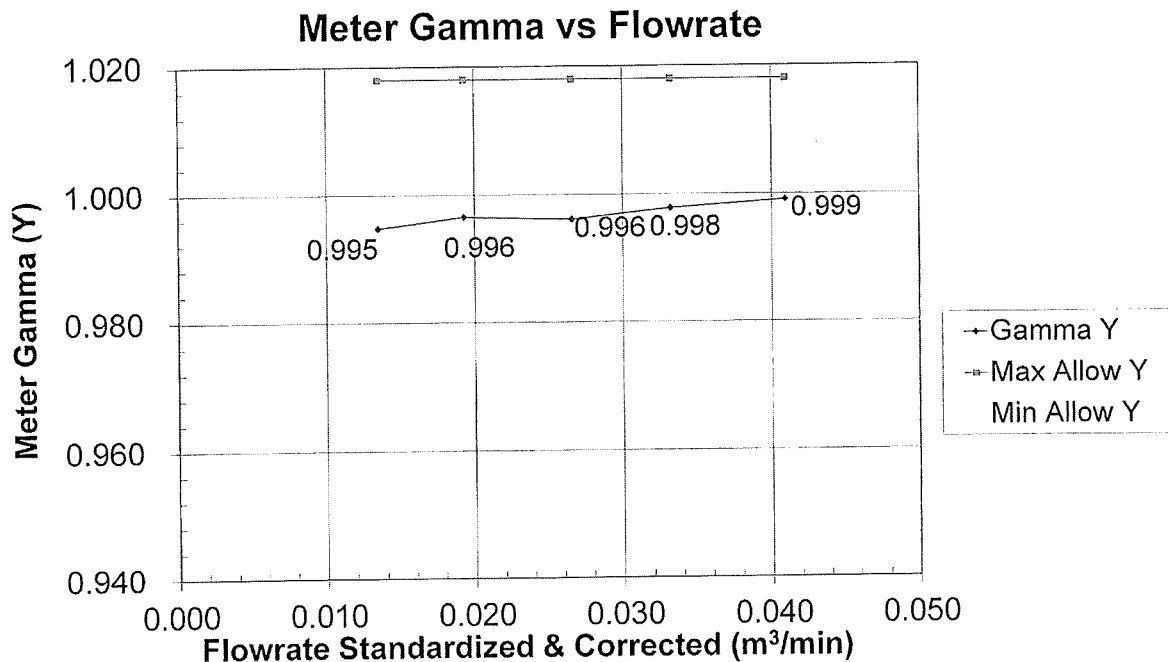
Results								
Standardized Data				Dry Gas Meter				
Dry Gas Meter		Calibration Meter		Calibration Factor		Flowrate		ΔH @
(V _{std})	(Q _{std})	(V _{ref})	(Q _{ref})	Value (Y)	Variation (ΔY)	Std & Corr (Q _{std/corr})	ΔH @	Variation (ΔΔH @)
m ³	m ³ /min	m ³	m ³ /min			m ³ /min	mm H ₂ O	
0.203	0.014	0.202	0.013	0.995	-0.002	0.013	31.362	0.067
0.194	0.019	0.193	0.019	0.995	0.000	0.019	29.552	-1.742
0.214	0.027	0.213	0.027	0.996	-0.001	0.027	31.256	-0.038
0.233	0.033	0.233	0.033	0.998	0.001	0.033	32.227	0.933
0.205	0.041	0.205	0.041	0.999	0.002	0.041	32.074	0.780
				0.997	Y Average		31.294	ΔH @ Average

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ± 0.02
Note: For ΔH_{std}, orifice pressure differential that equates to 0.76cm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1mm) H₂O.

Signature Sithiporn (Sithiporn Chaisana) Service Engineer
บริษัท สิทธีพรแอสโซซิเอตส์ จำกัด
SITHIPORN ASSOCIATES COMPANY LTD.
Date 23/8/2021

Calibration Date: 23-8-2021

Calibration Reference No: GC64APE0039



Console Serial: 0306016

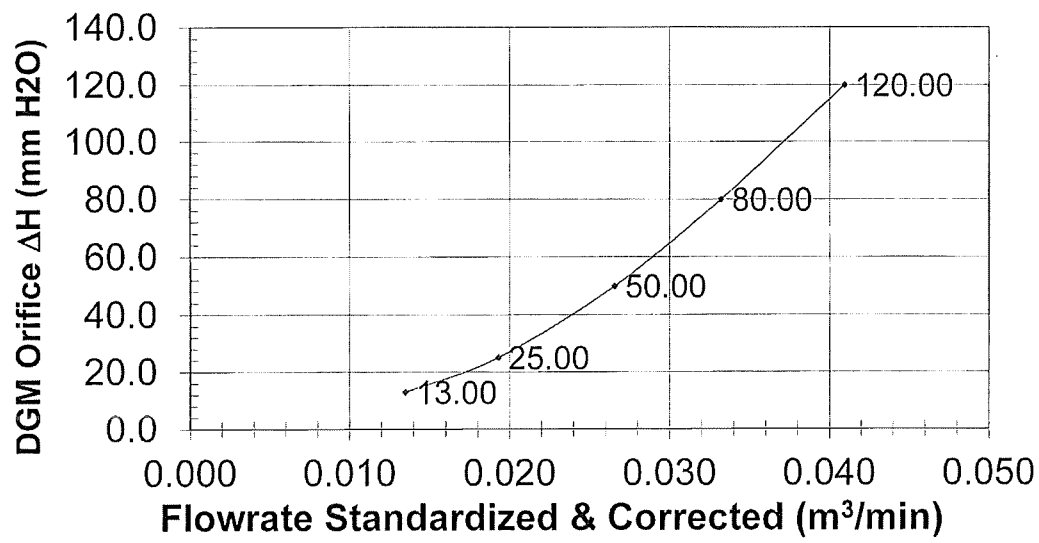
บริษัท สิทธีพรแอสโซซิเอตส์ จำกัด
SITHIPORN ASSOCIATES COMPANY LTD.

Console Model: XC-572V

Calibration Date: 23-8-2021

Calibration Reference No: GC64APE0039

Meter Pressure vs Flowrate



Console Serial: 0306016

Console Model: XC-572V

บริษัท สิทริพมอัสโซซิเอต จำกัด
SITHIPORN ASSOCIATES COMPANY LIMITED



ENTECH
Difference For Greater Value

Calibration Certificate

Certificate No: G 650161
Date of issue : 16-Mar-22

Instrument description : Flue gas Analyzer
Instrument model : Testo 350 XL
Instrument serial no. : 00908697
ID no. or control no. :
Manufacturer : testo SE
Probe description :
Probe model :
Probe serial :
Customer name : Environment Research & Technology Co., Ltd.
Customer address : 25/114 Moo 6, Soi Chinakhet 1, Ngamwongwan Rd., Toongsonghong, Laksi, Bangkok 10210 Thailand
Total pages of certificate : 2 Pages
Receiving no. : L-220808
Receiving date. : 10-Mar-22
Parameter of calibration : Gas Calibration(Oxygen 2.498,10.00,21.00 %vol, Carbon Monoxide 80.97,309.9,1003 ppm, Nitrogen Dioxide 80.62 ppm, Nitric Oxide 150.9 ppm, Sulphur Dioxide 100.9 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 \pm 5 $^{\circ}$ C
Humidity : 55 \pm 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no. : WI-CL-28-C

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

Date of calibration : 15-Mar-22

Mr. Kwanchai Khandoung
Calibration Technician

Mrs. Nongluck Wongsettee
Technical Manager

FM-CL-09-C Rev.8

Page 1 of 2

Issued Date 26/02/16



ENTECH
Difference For Greater Value

Calibration Certificate

Certificate No.: G 650161

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O ₂) 10.00 % Vol	2453/19	Linde	18-Jun-23
Oxygen (O ₂) 21.00 % Vol	2426/19	Linde	16-Jul-23
Carbon monoxide (CO) 80.97 ppm	2842/21	Linde	24-Jun-23
Carbon monoxide (CO) 309.9 ppm	2803/21	Linde	22-Jun-23
Carbon monoxide (CO) 1003 ppm	2803/21	Linde	23-Apr-23
Nitrogen Dioxide (NO ₂) 80.62 ppm	3240/21	Linde	25 Jul 23
Nitric Oxide (NO) 150.9 ppm	2857/21	Linde	27-Jun-23
Sulphur Dioxide (SO ₂) 100.9 ppm	4942/20	Linde	20 Nov 22

Measured room conditions

Temperature : 21.6 $^{\circ}$ C Humidity : 53.8 %RH Pressure : 1012.4 mbar
Calibration conditions
Gas Temperature : 23 $^{\circ}$ C Flow rate : 1,200 ml/min Gas pressure : 1022.3 mbar

Calibration Results (without adjustment) (Table 2)

Parameter of Standard	Mean of		Uncertainty (\pm)
	Standard Values	UUC	
O ₂ (%Vol)	2.498	2.54	0.20
O ₂ (%Vol)	10.00	10.07	0.07
O ₂ (%Vol)	21.00	21.13	0.13
CO (ppm)	80.97	80	2.8
CO (ppm)	309.9	308	-1.9
CO (ppm)	1003	994	-9
*NO ₂ (ppm)	80.62	80.1	-0.52
*NO (ppm)	150.9	153	2.1
*SO ₂ (ppm)	100.9	98	-2.9

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

* Calibrations marked Not TISI Accredited "in this Certificate have been included for completeness."

End of Report

FM-CL-09-C Rev.8

Page 2 of 2


Issued Date 26/02/16

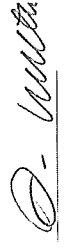
Certificate no. : T 650050
Date of issue : 07-Feb-22

Instrument description : Digital Thermometer
Instrument model : 305
Instrument serial no. : N0005692
ID no. or control no. : STACK2
Manufacturer :
Probe description : Immersion probe, Type K, Diameter 7.2 mm., Long 3,600 mm., Material Stainless
Probe model : TM05
Probe serial :
Customer name : Environment Research & Technology Co., Ltd.
Customer address : 25/114 Moo 6, Soi Chinakhet 1, Ngamwongwan Road., Toongsonghong, Laksi, Bangkok 10210 Thailand

Total pages of certificate : 2 Pages
Receiving no. : L-220449
Receiving date : 03-Feb-22
Parameter of calibration : Temperature Calibration
Condition of UUC : Used
Ambient condition : All of the measurement were carried out in the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48 Toongsonghong Laksi Bangkok

Calibration procedure no. : WI-CL-14-C
The calibration certificate expanded uncertainty of measurements is stated as the standard uncertainty of measurement multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test environmental condition.
This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal are not valid.
This calibration certificate documents are traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).
Date of calibration : 05-Feb-22


Mr. Pearawat Thongbai
Calibration Technician


Mrs. Nongluck Wongsettee
Technical Manager

Certificate no. : T 650050

Standard	Reference no.	Vendor	Due date
Dry Block ATC-650B	Performance	ENTECH	21-Sep-22
Digital Thermometer with probe	PSL-T 0138/65	TISSTR	11-Jan-23
Digital Thermometer with probe	SG-T-00213/64	Success Gateway	11-Feb-22
Dry Block ELUK PTB150	Performance Test	ENTECH	18-Mar-22

Measured room conditions
Temperature : 22.3 °C Humidity : 53.6 %RH Pressure : 1012.8 mbar
Calibration conditions
Immersion Depth : 140 mm.
Calibration results (without adjustment)

Parameter of standard	Standard values	Mean of UUC.	Error	Uncertainty (±)
Temperature (°C)	30.03	30.8	0.77	0.33
Temperature (°C)	150.04	151.3	1.26	0.75
Temperature (°C)	400.02	403	2.98	1.8

Remark : -

End of report



Certificate of Calibration

Certificate Number : MB2-022-2022

Page 1 of 2 Pages

Equipment : Electronic Balance

Manufacturer : Radwag

Model : WTB2000

Serial Number : 460684

ID Number : Stack 3

Max Capacity : 2000 (g)

Resolution : 0.01 (g)

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %.The uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements. This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). This Certificate may not be reproduced other than in full except with the prior written approval of Calibration Center, Intro TSC Co.,Ltd.

Customer Reference : F411

Customer : Environment Research&Technology Co., Ltd.

CSRS No.: CSRS01430122

25/114 Moo 6 Soi Chinaket 1, Ngamongwan Road.,

Date of Receipt : 20-Jan-22

Toongsonghong, Laksi, Bangkok 10210

Date of Calibration : 20-Jan-22

Location : Mass Calibration Laboratory

Condition of this result of calibration

1. Reference Standard instruments :

Instruments	Model	Serial No.	Certificate No.	Due Date
Standard Weight Set (1 g to 5000 g)	N/A	N/A	21M1065	15-Jun-22

2. This Certification is traceable to the International System of Unit maintained at : -

- Techonology Promotion Association (Thailand-Japan)

3. This result of calibration was found accurate as shown on date and place of calibration only.

Method : Measurement In-house Method Calibration Procedure No. CP-CL-07 base on UKAS Publication Ref : Lab 14 : 2019

Environmental Conditions :

Temperature : (20 ± 2) °C

Humidity : (50 ± 15) %

Air Pressure : (1010 ± 10) mbar

Calibrated By : Mr. Montree Kaewlodla

Date of Issued : 21-Jan-22

Approved Signatory :

Mr. Panuchit Samart



Certificate Number : MB2-022-2022

Page 2 of 2 Pages

Calibration Result (Weight) : Without Adjustment

1. Repeatability of Reading

Nominal Value (g)	Standard Deviation (g)	Maximum diff. Between successive (g)
2000	0.000	0.00

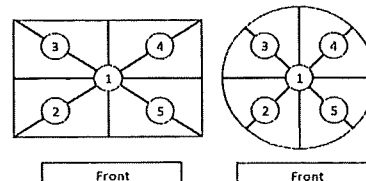
2. Error of indication from nominal value

Nominal Value (g)	Balance Reading (g)	Correction Value (g)	Uncertainty (\pm) (g)	factor k	Balance Reading Before Adjust (g)
Unload	0.00	0.00	0.0082	2.00	-
200	200.00	0.00	0.0082	2.00	-
400	400.00	0.00	0.0083	2.00	-
600	600.00	0.00	0.0085	2.00	-
800	800.00	0.00	0.0087	2.00	-
1000	1000.00	0.00	0.0087	2.00	-
1200	1199.99	0.01	0.095	2.00	-
1400	1399.99	0.01	0.095	2.00	-
1600	1599.98	0.02	0.095	2.00	-
1800	1799.98	0.02	0.095	2.00	-
2000	1999.98	0.02	0.095	2.00	-

3. Eccentric or off-center loading

Nominal Value (g)	Reference Position				
	Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
1000	1000.00	999.98	999.94	999.98	1000.02

Eccentric Error = 0.06 (g)



End of report

Chue

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lualaba Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+66 2723 0382
MT-TH.ServicesSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: ENVIRONMENT RESEARCH TECHNOLOGY CO., LTD.
Address: 25/114 Moo 6, Soi Chinakel 1, Ngamwongwan Rd., Toongsongkhro
City: Lakki
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 10210
Contact: Ramita Taengthai



Weighing Device

Manufacturer: Mettler Toledo
Model: MS204S/01
Serial No.: B44523916A
Building: N/A
Floor: 4
Room: 411
Weighing Instrument: ERTC-L-IN-107
Asset Number: N/A
Terminal Model: N/A
Terminal Serial No.: N/A
Terminal Asset No.: N/A

Range	Max. Capacity	Readability (g)
1	220 g	0.0001 g

Procedure

Calibration Guideline:
METTLER TOLEDO Work Instruction:
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.
The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Start: 18.5 °C	End: 18.7 °C	Start: 49.7 %	End: 50.0 %
Temperature	Humidity			

As Found Calibration Date: 19-Jan-2022
As Left Calibration Date: N/A
Issue Date: 20-Jan-2022
Calibrator: Suwicha Choykamdu
Approved Signatory:
☒ Kasakorn Tassunachaisakul
☐ Santi Jitinyom
☐ Surachet Sukkate

Measurement Results

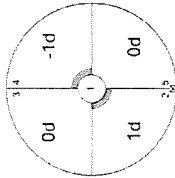
Repeatability

Test Load: 100 g	As Found	As Left
1	100.0000 g	N/A
2	99.9999 g	N/A
3	100.0000 g	N/A
4	100.0001 g	N/A
5	100.0001 g	N/A
6	100.0000 g	N/A
7	99.9999 g	N/A
8	100.0000 g	N/A
9	100.0001 g	N/A
10	100.0000 g	N/A
Standard Deviation	0.00007 g	N/A

The "g" in the graph represents the readability of the range/interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g	Position	As Found	As Left
1	1	100.0000 g	N/A
2	2	100.0001 g	N/A
3	3	100.0000 g	N/A
4	4	99.9999 g	N/A
5	5	100.0000 g	N/A
Maximum Deviation		0.0001 g	N/A



As Found

The "g" in the graph represents the readability of the range/interval in which the test was performed.

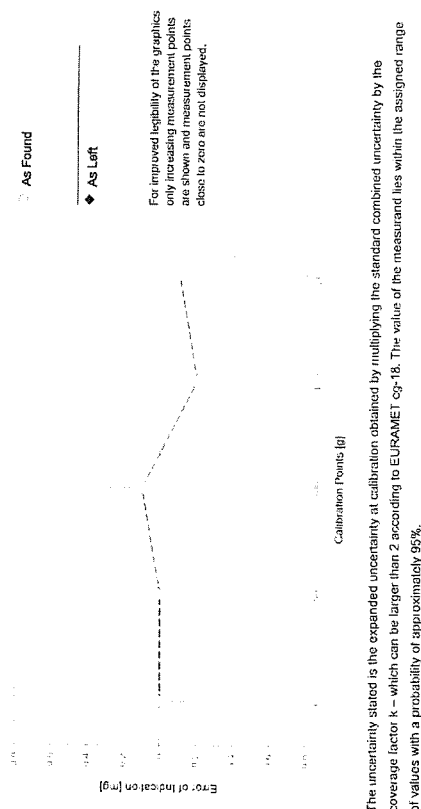
Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.16 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.17 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.17 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.17 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.17 mg	2
6	5.0000 g	5.0000 g	0.0000 g	0.17 mg	2
7	10.0000 g	10.0000 g	0.0000 g	0.18 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.21 mg	2
9	99.9999 g	100.0000 g	0.0001 g	0.26 mg	2
10	149.9999 g	149.9997 g	-0.0002 g	0.36 mg	2
11	199.9999 g	199.9998 g	-0.0001 g	0.40 mg	2



Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2			
Weight Set No.:	WS03	Date of Issue:	21-Sep-2021
Certificate Number:	175498	Calibration Due Date:	14-Mar-2023
Thermo Hygrometer			
Equipment No.:	IN281	Date of Issue:	25-May-2021
Certificate Number:	21H1100	Calibration Due Date:	10-May-2022

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: 1.5 · 10⁻⁶ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 4 K

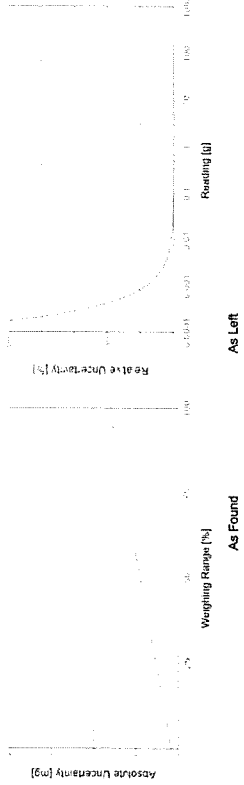
Linearization of Uncertainty Equation

Range	As Found		As Left
	d	Max	
1	0.0001 g	220 g	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.0220 g	0.17 mg	N/A
0.2200 g	0.17 mg	N/A
2.2000 g	0.18 mg	N/A
22.0000 g	0.31 mg	N/A
220.0000 g	1.6 mg	N/A



GWP®

Certificate



As Found



As Left



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



As Found



As Left

No adjustments/modifications made. As Left results correspond to As Found.

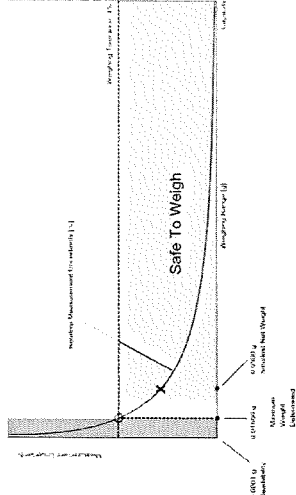
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0500 g

Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left loading, unless only As Found was performed.

20-1-68

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.16976 g	0.34177 g	0.51607 g	0.87172 g	1.80429 g
0.2%	0.08460 g	0.16976 g	0.25548 g	0.42863 g	0.87172 g
0.5%	0.03378 g	0.06764 g	0.10159 g	0.16976 g	0.34177 g
1%	0.01688 g	0.03378 g	0.05070 g	0.09460 g	0.16976 g
2%	0.00844 g	0.01688 g	0.02532 g	0.04223 g	0.08460 g
5%	0.00337 g	0.00675 g	0.01012 g	0.01688 g	0.03378 g

Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.16976 g	0.34177 g	0.51607 g	0.87172 g	1.80429 g
0.2%	0.08460 g	0.16976 g	0.25548 g	0.42863 g	0.87172 g
0.5%	0.03378 g	0.06764 g	0.10159 g	0.16976 g	0.34177 g
1%	0.01688 g	0.03378 g	0.05070 g	0.09460 g	0.16976 g
2%	0.00844 g	0.01688 g	0.02532 g	0.04223 g	0.08460 g
5%	0.00337 g	0.00675 g	0.01012 g	0.01688 g	0.03378 g

Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with $k = 2$ and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the pass, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

As Found		Repeatability	Eccentricity	Error of Indication
As Found	As Left	✓	✓	✓
✓ = Passed				
✗ = Failed				
I. = Safety Factor not met				

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found	Std. Deviation	Result	As Left	Std. Deviation	Result
0.1%	N/A			N/A			N/A
0.2%	0.00005 g			✗			✗
0.5%	0.00013 g			✓			✓
1%	0.00025 g		0.00007 g*	✓		0.00007 g*	✓
2%	0.00050 g		✓	✓		✓	✓
5%	0.00125 g		✓	✓		✓	✓

*The calculated standard deviation value is below the rounding error of the balance. The 0.414 rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found	Deviation	Result	As Left	Deviation	Result
0.1%	0.0500 g			✓			✓
0.2%	0.1000 g			✓			✓
0.5%	0.2500 g			✓			✓
1%	0.5000 g		0.0001 g	✓		0.0001 g	✓
2%	1.0000 g		✓	✓		✓	✓
5%	2.5000 g		✓	✓		✓	✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g
149.9999 g	-0.0002 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g
199.9999 g	-0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g
Result		✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g
149.9999 g	-0.0002 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g
199.9999 g	-0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g
Result		✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

Service Date: 2022-01-19
Document Number: TH2065-103-011922-LABSLINCOHR
ENVIRONMENT RESEARCH & TECHNOLOGY CO., LTD
25/114 Moo 6, Soi Charakot 1, Ngamwongwan Rd., Tuangongtho a.n.s.w.a.r.n.a., Lakso, Bangkok 10210
Rumita Traingthai

METTLER TOLEDO

Balance Health Report

Device Details		System Details	
Manufacturer:	Mettler Toledo	Accessory 1:	
Model:	MS204S01	Accessory 2:	
Serial number:	B445230164	Weight set for routine testing:	Yes /
Firmware:	2.22		

History		Device History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year		
Instrument age:	3-10 years	Last instrument calibration:	< 1 year		
Spare parts available:	Yes	Last minimum weight determination:	< 1 year		
Regulations:	ISO				
Process tolerance in %:	1%	Routine testing performed:	Yes		
Smallest sample net weight:	0.0500g				

Check List		General & Functional Checks	
Room temperature fluctuation	✓	Leveling	✓
Exposure to direct sun	✓	Cleanliness	✓
Vibrations	✓	Completeness - missing parts see additional remarks	✓
Draft	✓	Settings optimized for operating environment	✓
Dirt or dust	✓	Other - objections noted as additional remarks	—
Static	✓		
Mechanical Component Checks		Electrical Component Checks	
Draft shield	✓	Power supply	✓
Weighing pan position	✓	Sliding door drive	—
Housing	✓	Internal weight drive	✓
Other - objections noted as additional remarks	—	Display	✓
		Other - objections noted as additional remarks	—

Recommendations		Process Efficiency	
Instrument calibration		Uninstall instrument	
Identify safe weighing range		Replace instrument	
GWP verification / risk assessment		Replace / add parts (see additional remarks)	
Preventive maintenance		Onsite repair	
Perform routine testing with test weights		Disposal repair	
User training		Use of accessories (see additional remarks)	

Contact	Name:	Rumita Traingthai	Position:	N/A	Phone:	086-0334490	Email:	rumita@environmentresearch.co.th
Additional Remarks & Recommendations								
Expiry Details								
Date:								
Name:								
Signature:								

This is not a certificate.

It should not be used to interpret final results for the testing of these devices.

Legend: ✓ Good/Pass .J Needs Attention ✗ Bad/Fail — Not Applicable

34604 84W0 Locale Rd, Banana Ta Sub District, Banang District, Bangkok 10200, 666 2720 0002
P.O. Box 100, Bangkok 10200, 666 2720 0002
www.mt.com

METTLER TOLEDO Service

26-1-15

Sound Level Meter Calibration Report

Support Equipment Type : Sound Level Calibrator

Manufacture : Quest Electronics

Model : QC-10

Serial No. : QE2080089

Range of Calibrator

- Sound Pressure Level : 114.0 dB.

- **Frequency** : 1,000 Hz.

Calibrated By : Mr.Siwawut Thamnita

Calibration Date : April 19, 2022

Customer Name : บริษัท โพรทีเยอร์ คอนสตรัคชั่น จำกัด : โครงการผลิตไอน้ำและไฟฟ้าขนาดเล็ก ของบริษัท บี.กริม เพาเวอร์ (อ่างทอง) 1 จำกัด (ชื่อตาม EIA บริษัท สยามเพียวไรท์ จำกัด)

[illegible]

Checked By

Mr. Prayun Detkla
Technician

Approved By

Ms.Sutatip Im-noi
Environmental Scientist



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0733

MTC No. EEL. BP. 90/0764

CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co.,Ltd.
Address : 25/114 Moo 6, Soi Chinnaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok, 10210.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Calibrator

Manufacturer : Quest Electronics

Model : QC-10

Serial No. : QE2080089

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 21 Jul. 2020

Date of Calibration : 28 Jul. 2021

1/2 ✓

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

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

FM.BL.MTC.002 Rev.4

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office
196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0733

MTC No. EEL. BP. 90/0764

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

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	113.99	-0.01	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	998.3	-1.7	± 1.5	$\pm 1.0\%$

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.01	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

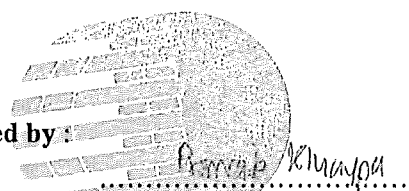
2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Acting Director

Date of Calibration : 28 Jul. 2021

Electrical and Electronic Standards Laboratory

Date of Issue : 30 Jul. 2021

Industrial Metrology and Testing Service Centre

Ref : 2011264072103155002

End of Certificate

2 / 2

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

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เอกสารการสอบเทียบเครื่องมือตรวจวัด
บริษัท เทสท์ เทค จำกัด



ที่ อว 0303/12060

ใบรับรองความสามารถห้องปฏิบัติการทดสอบ

ใบรับรองฉบับนี้ให้ไว้เพื่อแสดงว่า

บริษัท เทสต์ เทคโนโลยี จำกัด

เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2

แขวงสามยุค เขตบางขุนเทียน กรุงเทพมหานคร 10150

ได้ผ่านการประเมินความสามารถห้องปฏิบัติการทดสอบตามมาตรฐาน ISO/IEC 17025 : 2017

และข้อกำหนด กฎระเบียบ และเงื่อนไขการรับรองความสามารถห้องปฏิบัติการทดสอบ

ของกองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ

LABORATORY ACCREDITATION

หมายเลขการรับรองระบบงานที่ ทดสอบ - 0001

BLA-DSS

รายละเอียดการรับรองดังข้อบ่งชี้การรับรองแนบท้าย

ออกให้ ณ วันที่ : 1 กันยายน 2564

หมดอายุ วันที่ : 14 กรกฎาคม 2566

ลงชื่อ

:

(นางพจมาน ทาจีน)

ผู้อำนวยการกองบริหารและรับรองห้องปฏิบัติการ

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ

กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอบข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ภายใน ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1	น้ำ	<p>- สารแขวนลอยทั้งหมด ที่อุณหภูมิ 103 °C ถึง 105 °C 20 mg/L ถึง 5 000 mg/L</p> <p>- สารที่ละลายได้ทั้งหมด ที่อุณหภูมิ 180 °C 25 mg/L ถึง 8 000 mg/L</p> <p>- สารที่ละลายได้ทั้งหมด ที่อุณหภูมิ 103 °C ถึง 105 °C 25 mg/L ถึง 8 000 mg/L</p>	<p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2540 D</p> <p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C</p> <p>In - house method : TE-24 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 2540 C</p>

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- ซีโอดี 40 mg/L ถึง 2 000 mg/L - ความเป็นกรด-ด่าง 4.0 ถึง 9.0 - ความขุ่น 0.50 NTU ถึง 1 000 NTU	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5220 C In - house method : TE-19 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 H ⁺ B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2130 B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150
 หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001
 สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- สภาพนำไฟฟ้า 100 $\mu\text{S}/\text{cm}$ ถึง 5 000 $\mu\text{S}/\text{cm}$ - ไซยาไนต์ 0.005 mg/L ถึง 0.200 mg/L - สารลดแรงตึงผิว (คำนวณเป็น LAS) 0.10 mg/L ถึง 30.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2510 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500- CN ⁻ C, E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5540 C

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสต์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- ค่าสี 3.00 Pt-Co unit ถึง 100 Pt-Co unit - แคลเมียม 0.10 mg/L ถึง 1.00 mg/L - ทองแดง 0.10 mg/L ถึง 4.00 mg/L - สังกะสี 0.10 mg/L ถึง 2.00 mg/L - แมงกานีส 0.10 mg/L ถึง 2.00 mg/L - เหล็ก 0.10 mg/L ถึง 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2120 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3111 B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- โปรท 0.0010 mg/L ถึง 0.0500 mg/L - สารหนู 0.0020 mg/L ถึง 0.0300 mg/L - ซีลีเนียม 0.0005 mg/L ถึง 0.0500 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3112 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3114 C

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- แบริยม 0.02 mg/L ถึง 2.00 mg/L - แคดเมียม 0.02 mg/L ถึง 2.00 mg/L - โครเมียมทั้งหมด 0.02 mg/L ถึง 2.00 mg/L - ทองแดง 0.02 mg/L ถึง 2.00 mg/L - แมงกานีส 0.02 mg/L ถึง 2.00 mg/L - นิกเกิล 0.02 mg/L ถึง 2.00 mg/L - ตะกั่ว 0.02 mg/L ถึง 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3120 B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสต์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	<p>- <i>Clostridium perfringens</i> Detected or not detected</p> <p>- <i>Pseudomonas aeruginosa</i> Detected or not detected</p> <p>- ปริมาณน้ำมันและไขมัน 3.0 mg/L ถึง 50.0 mg/L</p>	<p>Standing Committee of Analysts, The Microbiology of Drinking Water, 2021, part 6</p> <p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 9213 E</p> <p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5520 D</p>

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอบข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- ปริมาณน้ำมันและไขมัน 3.0 mg/L ถึง 50.0 mg/L - ไนเตรทในรูปไนโตรเจน 0.05 mg/L ถึง 10.00 mg/L - ไนเตรท 0.22 mg/L ถึง 44.30 mg/L - ไนไตรท์ในรูปไนโตรเจน 0.02 mg/L ถึง 3.00 mg/L - ไนไตรท์ 0.07 mg/L ถึง 10.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5520 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₃ ⁻ E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₂ ⁻ B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- ไนโตรเจนในรูป ที เค เอ็น 2.0 mg/L ถึง 200 mg/L - ฟลูออไรด์ 0.30 mg/L ถึง 1.40 mg/L - ฟลูออไรด์ 0.30 mg/L ถึง 5.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - N _{org} B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - F ⁻ D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - F ⁻ C

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอบข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- บีโอดี 2.0 mg/L ถึง 2 000 mg/L - บีโอดี 2.0 mg/L ถึง 2 000 mg/L - ซัลเฟต 5.00 mg/L ถึง 200 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B, part 4500 – O G Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B, part 4500 – O C In – house Method : TE-34 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 – SO ₄ ²⁻ E

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- ซิลิกา 0.10 mg/L ถึง 10.00 mg/L - เหล็ก 0.10 mg/L ถึง 1.50 mg/L - แมงกานีส 0.04 mg/L ถึง 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 – SiO ₂ C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3500 – Fe B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3500 – Mn B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ

: บริษัท เทสท์ เทค จำกัด

สถานที่ตั้ง

: เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2

แขวงสามดัว เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่

: ทดสอบ - 0001

สถานะของห้องปฏิบัติการ

: ☒ถาวร ☐นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2	น้ำเสีย	- สารแขวนลอยทั้งหมด ที่อุณหภูมิ 103 °C ถึง 105 °C 20 mg/L ถึง 5 000 mg/L - สารที่ละลายได้ทั้งหมด ที่อุณหภูมิ 180 °C 25 mg/L ถึง 8 000 mg/L - สารที่ละลายได้ทั้งหมด ที่อุณหภูมิ 103 °C ถึง 105 °C 25 mg/L ถึง 8 000 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C In - house method : TE-24 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- ซีโอดี 40 mg/L ถึง 2 000 mg/L - ความเป็นกรด-ด่าง 4.0 ถึง 9.0 - ความขุ่น 0.50 NTU ถึง 1 000 NTU	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5220 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 H ⁺ B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2130 B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสต์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150
 หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001
 สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- สภาพนำไฟฟ้า 100 $\mu\text{S}/\text{cm}$ ถึง 5 000 $\mu\text{S}/\text{cm}$ - ไซยาไนต์ 0.005 mg/L ถึง 0.200 mg/L - สารลดแรงตึงผิว (คำนวณเป็น LAS) 0.10 mg/L ถึง 30.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2510 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500- CN ⁻ C, E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5540 C

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสต์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- ค่าสี 5 ADMI ถึง 300 ADMI - แคดเมียม 0.10 mg/L ถึง 1.00 mg/L - ทองแดง 0.10 mg/L ถึง 4.00 mg/L - สังกะสี 0.10 mg/L ถึง 2.00 mg/L - แมงกานีส 0.10 mg/L ถึง 2.00 mg/L - เหล็ก 0.10 mg/L ถึง 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2120 F Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3111 B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- แบเรียม 0.02 mg/L ถึง 2.00 mg/L - แคดเมียม 0.02 mg/L ถึง 2.00 mg/L - โครเมียมทั้งหมด 0.02 mg/L ถึง 2.00 mg/L - ทองแดง 0.02 mg/L ถึง 2.00 mg/L - แมงกานีส 0.02 mg/L ถึง 2.00 mg/L - นิกเกิล 0.02 mg/L ถึง 2.00 mg/L - ตะกั่ว 0.02 mg/L ถึง 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3120 B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสต์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ภายใน ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- โปรท 0.0010 mg/L ถึง 0.0500 mg/L - สารหนู 0.0020 mg/L ถึง 0.0300 mg/L - ซิลิเนียม 0.0005 mg/L ถึง 0.0500 mg/L - ปริมาณน้ำมันและไขมัน 3.0 mg/L ถึง 50.0 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3112 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3114 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5520 D

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอบข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- ปริมาณน้ำมันและไขมัน 3.0 mg/L ถึง 50.0 mg/L - ไนเตรทในรูปไนโตรเจน 0.05 mg/L ถึง 10.00 mg/L - ไนเตรท 0.22 mg/L ถึง 44.30 mg/L - ไนโตรทในรูปไนโตรเจน 0.02 mg/L ถึง 3.00 mg/L - ไนไตรท์ 0.07 mg/L ถึง 10.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5520 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₃ ⁻ E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₂ ⁻ B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- ไนโตรเจนในรูป ที เค เอ็น 2.0 mg/L ถึง 200 mg/L - บีโอดี 2.0 mg/L ถึง 2 000 mg/L - บีโอดี 2.0 mg/L ถึง 2 000 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - N _{org} B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B, part 4500 - O G Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B, part 4500 - O C

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150
 หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001
 สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- ฟลูออไรด์ 0.30 mg/L ถึง 1.40 mg/L - ฟลูออไรด์ 0.30 mg/L ถึง 5.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 – F ⁻ D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 – F ⁻ C
3	น้ำสระว่ายน้ำ	- <i>Staphylococcus aureus</i> Detected or not detected	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 9213 B

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : บริษัท เทสท์ เทค จำกัด
 สถานที่ตั้ง : เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
 แขวงสามตำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

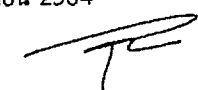
หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0001

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
3 (ต่อ)	น้ำสระว่ายน้ำ	- <i>Pseudomonas aeruginosa</i> Detected or not detected	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 9213 E

ออกให้ ณ วันที่ : 1 กันยายน 2564

ลงชื่อ :



(นางพจมาน ทำจีน)

ผู้อำนวยการกองบริหารและรับรองห้องปฏิบัติการ

ออกครั้งแรก ณ วันที่ 7 กรกฎาคม 2547

ฉบับที่ 13

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม



Ref No. : 0303/12060

CERTIFICATE OF TESTING LABORATORY ACCREDITATION

This is to certify that

TEST TECH CO., LTD.

**30, 32 Soi Rama 2, Soi 63, Rama 2 Road, Samaedam,
Bangkhunthian, Bangkok 10150**


has successfully undergone assessment according to ISO/IEC 17025 : 2017
and under the Bureau of Laboratory Accreditation, Department of Science Service
for the requirements, regulations and criteria for the competence of testing laboratories

LABORATORY ACCREDITATION
Accreditation Number TESTING - 0001
BLA-DSS

The scope of accreditation is as annexed hereto

Issue date : **1st September 2021**

Expired date : **14th July 2023**

Signature : 

(Mrs. Pochaman Tagheen)

Director of Bureau of Laboratory Accreditation

Scope of Testing Laboratory Accreditation

Laboratory Name : TEST TECH CO., LTD.

Address : 30, 32 Soi Rama 2, Soi 63, Rama 2 Road, Samaedam,
Bangkhunthian, Bangkok 10150

Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1	Water	- Total suspended solids at 103 °C to 105 °C 20 mg/L to 5 000 mg/L - Total dissolved solids at 180 °C 25 mg/L to 8 000 mg/L - Total dissolved solids at 103 °C to 105 °C 25 mg/L to 8 000 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C In - house method : TE-24 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C

Initial Issue Date 7th July 2004

Issue Number 13

Bureau of Laboratory Accreditation, Department of Science Service, Ministry of Higher Education, Science, Research and Innovation

Scope of Testing Laboratory Accreditation

Laboratory Name : TEST TECH CO., LTD.

Address : 30, 32 Soi Rama 2, Soi 63, Rama 2 Road, Samaedam,
Bangkhunthian, Bangkok 10150

Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1	Water	- COD 40 mg/L to 2 000 mg/L - pH 4.0 to 9.0 - Turbidity 0.50 NTU to 1 000 NTU	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5220 C In - house method : TE-19 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 H ⁺ B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2130 B

Initial Issue Date 7th July 2004

Issue Number 13

Bureau of Laboratory Accreditation, Department of Science Service, Ministry of Higher Education, Science, Research and Innovation

Scope of Testing Laboratory Accreditation

Laboratory Name : TEST TECH CO., LTD.

Address : 30, 32 Soi Rama 2, Soi 63, Rama 2 Road, Samaedam,
Bangkhunthian, Bangkok 10150

Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Conductivity 100 $\mu\text{S}/\text{cm}$ to 5 000 $\mu\text{S}/\text{cm}$ - Cyanide 0.005 mg/L to 0.200 mg/L - Surfactant (Calculated as LAS) 0.10 mg/L to 30.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2510 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500- CN ⁻ C, E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5540 C

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Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Color 3.00 Pt-Co unit to 100 Pt-Co unit - Cadmium 0.10 mg/L to 1.00 mg/L - Copper 0.10 mg/L to 4.00 mg/L - Zinc 0.10 mg/L to 2.00 mg/L - Manganese 0.10 mg/L to 2.00 mg/L - Iron 0.10 mg/L to 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2120 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3111 B

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Accreditation Number : Testing - 0001

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Mercury 0.0010 mg/L to 0.0500 mg/L - Arsenic 0.0020 mg/L to 0.0300 mg/L - Selenium 0.0005 mg/L to 0.0500 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3112 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3114 C

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Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Barium 0.02 mg/L to 2.00 mg/L - Cadmium 0.02 mg/L to 2.00 mg/L - Total chromium 0.02 mg/L to 2.00 mg/L - Copper 0.02 mg/L to 2.00 mg/L - Manganese 0.02 mg/L to 2.00 mg/L - Nickel 0.02 mg/L to 2.00 mg/L - Lead 0.02 mg/L to 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3120 B

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Bangkhunthian, Bangkok 10150

Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	<p>- <i>Clostridium perfringens</i> Detected or not detected</p> <p>- <i>Pseudomonas aeruginosa</i> Detected or not detected</p> <p>- Oil and Grease 3.0 mg/L to 50.0 mg/L</p>	<p>Standing Committee of Analysts, The Microbiology of Drinking Water, 2021, part 6</p> <p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 9213 E</p> <p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5520 D</p>

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Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Oil and Grease 3.0 mg/L to 50.0 mg/L - Nitrate as Nitrogen 0.05 mg/L to 10.00 mg/L - Nitrate 0.22 mg/L to 44.30 mg/L - Nitrite as Nitrogen 0.02 mg/L to 3.00 mg/L - Nitrite 0.07 mg/L to 10.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5520 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₃ ⁻ E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₂ ⁻ B

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Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Total Kjeldahl Nitrogen 2.0 mg/L to 200 mg/L - Fluoride 0.30 mg/L to 1.40 mg/L - Fluoride 0.30 mg/L to 5.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - N _{org} B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - F ⁻ D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - F ⁻ C

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Bangkhunthian, Bangkok 10150

Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- BOD 2.0 mg/L to 2 000 mg/L - BOD 2.0 mg/L to 2 000 mg/L - Sulfate 5.00 mg/L to 200 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B, part 4500 – O G Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B, part 4500 – O C In – house Method : TE-34 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 – SO ₄ ²⁻ E

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Silica 0.10 mg/L to 10.00 mg/L - Iron 0.10 mg/L to 1.50 mg/L - Manganese 0.04 mg/L to 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 – SiO ₂ C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3500 – Fe B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3500 – Mn B

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Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2	Wastewater	- Total suspended solids at 103 °C to 105 °C 20 mg/L to 5 000 mg/L - Total dissolved solids at 180 °C 25 mg/L to 8 000 mg/L - Total dissolved solids at 103 °C to 105 °C 25 mg/L to 8 000 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C In - house method : TE-24 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- COD 40 mg/L to 2 000 mg/L - pH 4.0 to 9.0 - Turbidity 0.50 NTU to 1 000 NTU	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5520 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 H ⁺ B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2130 B

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Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Conductivity 100 μ S/cm to 5 000 μ S/cm - Cyanide 0.005 mg/L to 0.200 mg/L - Surfactant (Calculated as LAS) 0.10 mg/L to 30.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2510 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500- CN ⁻ C, E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5540 C

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Color 5 ADMI to 300 ADMI - Cadmium 0.10 mg/L to 1.00 mg/L - Copper 0.10 mg/L to 4.00 mg/L - Zinc 0.10 mg/L to 2.00 mg/L - Manganese 0.10 mg/L to 2.00 mg/L - Iron 0.10 mg/L to 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2120 F Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3111 B

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Accreditation Number : Testing - 0001

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Barium 0.02 mg/L to 2.00 mg/L - Cadmium 0.02 mg/L to 2.00 mg/L - Total chromium 0.02 mg/L to 2.00 mg/L - Copper 0.02 mg/L to 2.00 mg/L - Manganese 0.02 mg/L to 2.00 mg/L - Nickel 0.02 mg/L to 2.00 mg/L - Lead 0.02 mg/L to 2.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3120 B

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Mercury 0.0010 mg/L to 0.0500 mg/L - Arsenic 0.0020 mg/L to 0.0300 mg/L - Selenium 0.0005 mg/L to 0.0500 mg/L - Oil and Grease 3.0 mg/L to 50.0 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3112 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3114 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5520 D

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Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Oil and Grease 3.0 mg/L to 50.0 mg/L - Nitrate as Nitrogen 0.05 mg/L to 10.00 mg/L - Nitrate 0.22 mg/L to 44.30 mg/L - Nitrite as Nitrogen 0.02 mg/L to 3.00 mg/L - Nitrite 0.07 mg/L to 10.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5520 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₃ ⁻ E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₂ ⁻ B

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Total Kjeldahl Nitrogen 2.0 mg/L to 200 mg/L - BOD 2.0 mg/L to 2 000 mg/L - BOD 2.0 mg/L to 2 000 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - N _{org} B, Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B, part 4500 - O G Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B, part 4500 - O C

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Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Fluoride 0.30 mg/L to 1.40 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 – F ⁻ D
		- Fluoride 0.30 mg/L to 5.00 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 – F ⁻ C
3	Swimming pool water	- <i>Staphylococcus aureus</i> Detected or not detected	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 9213 B

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Accreditation Number : Testing - 0001

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
3 (cont.)	Swimming pool water	- <i>Pseudomonas aeruginosa</i> Detected or not detected	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 9213 E

Issue Date : 1st September 2021

Signature :



(Mrs. Pochaman Tagheen)

Director of Bureau of Laboratory Accreditation

Initial Issue Date 7th July 2004

Issue Number 13

Bureau of Laboratory Accreditation, Department of Science Service, Ministry of Higher Education, Science, Research and Innovation



สำนักมาตรฐานห้องปฏิบัติการ
กระทรวงสาธารณสุข

หนังสือฉบับนี้ให้ไว้เพื่อแสดงว่า
ห้องปฏิบัติการ
บริษัท เทสท์ เทค จำกัด

เลขที่ 30, 32 ซอยพระรามที่ 2 ซอย 63 ถนนพระรามที่ 2
แขวงแสมดำ เขตบางขุนเทียน กรุงเทพมหานคร 10150

ได้รับการขึ้นทะเบียนเป็นห้องปฏิบัติการที่ผ่านการรับรองความสามารถ
ตามมาตรฐาน ISO/IEC 17025 : 2017 และข้อกำหนดและเงื่อนไขการรับรองความสามารถ
ห้องปฏิบัติการทดสอบด้านการแพทย์และสาธารณสุขของสำนักมาตรฐานห้องปฏิบัติการ
ตามรายการและวิธีทดสอบที่กำหนดในเอกสารแนบท้ายในด้าน

การทดสอบอาหาร

(ดร.กัทรวีร์ สร้อยสังวาลย์)

ผู้อำนวยการสำนักมาตรฐานห้องปฏิบัติการ

ให้ไว้ ณ วันที่ 26 พฤศจิกายน 2563

ถึงวันที่ 25 พฤศจิกายน 2565

หมายเลขทะเบียน 1201/54

ห้องปฏิบัติการ บริษัท เทสท์ เทค จำกัด ได้รับการรับรองความสามารถในการทดสอบ
อาหาร ดังรายการต่อไปนี้

ลำดับ	ชนิดผลิตภัณฑ์/ตัวอย่าง	รายการทดสอบ	วิธีทดสอบ
1.	<ul style="list-style-type: none"> • น้ำบริโภค <ul style="list-style-type: none"> - น้ำดื่ม - น้ำบริโภคภาชนะบรรจุปิดสนิท • น้ำอุปโภค <ul style="list-style-type: none"> - น้ำบาดาล - น้ำประปา - น้ำปราศจากไอออน - น้ำอาร์โอ - น้ำอ่อน - น้ำกวนล้าง - น้ำหล่อเย็น - น้ำในหม้อน้ำ 	1. ปริมาณของแข็งทั้งหมด	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 2540 B
		2. คลอไรด์	Standard Methods for the Examination of Water and Wastewater APHA, AWWA, WEF, 23 rd ed., 2017. Part 4500-Cl ⁻ B
		3. ค่าความกระด้าง	Standard Methods for the Examination of Water and Wastewater APHA, AWWA, WEF, 23 rd ed., 2017. Part 2340 C
		4. Total Plate Count 5. Total Bacteria Count	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 9215 B
		6. Total Coliform bacteria	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 9221 B
		7. <i>Escherichia coli</i>	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 9221 F
2.	<ul style="list-style-type: none"> • น้ำบริโภค <ul style="list-style-type: none"> - น้ำดื่ม 	8. เหล็ก 9. แมงกานีส	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 3111 B

สำนักมาตรฐานห้องปฏิบัติการ

แก้ไขครั้งที่ 00

วันที่แก้ไข 26 พฤศจิกายน 2563

หน้า 1 ของทั้งหมด 1 หน้า

หมายเลขทะเบียน 1201/54

ให้ใช้ ณ วันที่ 26 พฤศจิกายน 2563

ถึงวันที่ 25 พฤศจิกายน 2565

ตรวจสอบความถูกต้องโดย หัวหน้ากลุ่มรับรองห้องปฏิบัติการ..... (นายสรศักดิ์ หมั่นพล)



Bureau of Laboratory Quality Standards
Ministry of Public Health

This is to certify that
The laboratory of
Test Tech Co., Ltd.

30, 32 Rama 2 Soi 63, Rama 2 Road, Samae dam,

Bang khun thian, Bangkok 10150, Thailand

has been accepted as an
accredited laboratory complying with the ISO/IEC 17025 : 2017
and the requirements of the Bureau of Laboratory Quality Standards

The laboratory has been accredited for specific tests
listed in the scope within the field of

Food Testing

Patravee Soisangwan
(Dr. Patravee Soisangwan)

Director of Bureau of Laboratory Quality Standards

Date of Accreditation : 26 November 2020

Valid Until : 25 November 2022

Accreditation Number 1201/54

The Laboratory of Test Tech Co., LTD has been accepted as an accredited laboratory in the field of food testing for the following scopes.

No.	Type of Sample	Test	Method
1.	<ul style="list-style-type: none"> ● Potable water <ul style="list-style-type: none"> - Drinking water - Drinking water in sealed container ● Non-Potable water <ul style="list-style-type: none"> - Ground water - Tap water - DI water - RO water - Soft water - Cooling water - Chilled water - Boiler water 	1. Total Solid	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 2540 B
		2. Chloride	Standard Methods for the Examination of Water and Wastewater APHA, AWWA, WEF, 23 rd ed., 2017. Part 4500-Cl ⁻ B
		3. Total Hardness	Standard Methods for the Examination of Water and Wastewater APHA, AWWA, WEF, 23 rd ed., 2017. Part 2340 C
		4. Total Plate Count	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 9215 B
		5. Total Bacteria Count	
		6. Total Coliform bacteria	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 9221 B
		7. <i>Escherichia coli</i>	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 9221 F
2.	<ul style="list-style-type: none"> ● Potable water <ul style="list-style-type: none"> - Drinking water 	8. Iron 9. Manganese	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd ed., 2017. Part 3111 B

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ใบรับรองการสอบเทียบ "เทอร์โมมิเตอร์"

(Calibration Certificate of Liquid in Glass Thermometer)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 21T805

Page : 1 of 2

Equipment : Digital Thermometer With Sensor

Manufacturer: Testo

Model : 926

Serial No.: 5609260110250914

ID No.: EQL-058

Condition As-Received: Used Item

Received Date: 26 April 2021

Calibration Date: 28 April 2021
to 11 May 2021

Reference: 2104-0645WN

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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.

Submitted by: TEST TECH CO.,LTD (HEAD Office)

30,32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with
Industrial Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Black Stack Thermometer	1560	8C454	201581	20 May 2021
2) PRT Scanner Module	2562	A01303	201581	20 May 2021
3) Industrial PRT Probe	5627A	979442	201581	20 May 2021
4) Digital Thermometer	1529	A66176	2011303	07 Nov 2021
5) Industrial Platinum Resistance Thermometer	5627	739435	2011303	07 Nov 2021

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Pitak Srimongkol
Issue Date : 13 May 2021

Approved Signatory : _____

[] Phalinee Prabpaipal
[✓] Chatchawan Khunpiluek
[] Wanlop Larpkurn

B 0260224



Cert. No.: 21T805

Page.: 2 of 2

Result of Calibration:-

Without Adjustment

Function: Temperature measurement

This equipment was connected with Thermocouple Type T

ID No. EQL-058

<u>Immersion</u> <u>Depth</u> (mm.)	<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
150	3.9975	3.9	-0.0975	0.24
150	20.0005	19.9	-0.1005	0.24
150	34.9956	34.9	-0.0956	0.24
150	35.9978	36.0	0.0022	0.26
150	55.0023	54.7	-0.3023	0.25
150	100.0048	99.6	-0.4048	0.35
150	103.9978	103.8	-0.1978	0.36
150	119.9973	119.7	-0.2973	0.42
150	139.9975	139.7	-0.2975	0.47
150	150.0029	149.7	-0.3029	0.49
150	170.0037	169.6	-0.4037	0.55
150	179.9975	179.4	-0.5975	0.58

Result of Calibration:-

Without Adjustment

Function: Temperature measurement

This equipment was connected with Thermocouple Type T

ID No. EQL-058 Water Proof

Dimension of probe : Diameter 5 mm., Length 112 mm. Sheath material : Stainless Steel

<u>Immersion</u> <u>Depth</u> (mm.)	<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
90	40.9967	40.9	-0.0967	0.24
90	44.9988	44.9	-0.0988	0.24
90	50.0006	49.9	-0.1006	0.24
90	83.0026	82.8	-0.2026	0.31
90	91.9953	91.7	-0.2953	0.33
90	95.0009	94.7	-0.3009	0.34
90	149.9951	149.5	-0.4951	0.49

UUC* : Unit Under Calibration

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

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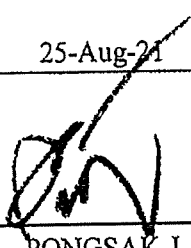


CERTIFICATE No : 21T8009
REFERENCE No : 62147-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : LIQUID IN GLASS THERMOMETER
MANUFACTURER : PRECISION
MODEL : ---
SERIAL No : 8925
ID No : EQL-103
RESOLUTION : 0.1 °C
TYPE : TOTAL IMMERSION
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHARUKIT L.
CALIBRATION DATE : 25-Aug-21
APPROVED BY : 
PONGSAK J.
ISSUED DATE : 25-Aug-21
RECEIVED DATE : 18-Aug-21



CERTIFICATE No : 21T8009

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : LIQUID IN GLASS THERMOMETER
MANUFACTURER : PRECISION
MODEL : ---
ID No : EQL-103
RESOLUTION : 0.1 °C
RECEIVED DATE : 18-Aug-21
AMBIENT TEMPERATURE : 23 °C ± 3 °C

SERIAL NUMBER : 8925
TYPE : TOTAL IMMERSION
CALIBRATION DATE : 25-Aug-21
RELATIVE HUMIDITY : 50 %RH ± 20 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON ASTM E77:1992 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON TS-90.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD THERMOMETER	1529	A22167	20T12169	10-Dec-21
2) SPRT PROBE	5612	587312	20T12169	10-Dec-21
3) PRECISION BATH	7320	A21105	20T12163	16-Dec-21
4) PRECISION BATH	CTR-40	A68155	20T12164	22-Dec-21

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	EMERGENT STEM TEMPERATURE (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
19.9958	20.0	140	-0.0042	N/A	0.079
25.0038	25.0	160	0.0038	N/A	0.079
41.5059	41.5	225	0.0059	N/A	0.079
44.5075	44.5	235	0.0075	N/A	0.079
45.0125	45.0	240	0.0125	N/A	0.079
50.0154	50.0	260	0.0154	N/A	0.084

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

F-G010 REV-02

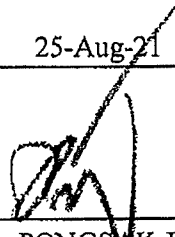


CERTIFICATE No : 21T8008
REFERENCE No : 62147-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : LIQUID IN GLASS THERMOMETER
MANUFACTURER : PRECISION
MODEL : G13004
SERIAL No : ---
ID No : EQL-111
RESOLUTION : 1 °C
TYPE : TOTAL IMMERSION
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHARUKIT L.
CALIBRATION DATE : 25-Aug-21
APPROVED BY : 
PONGSAK J.
ISSUED DATE : 25-Aug-21
RECEIVED DATE : 18-Aug-21



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkoe, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 21T8008

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : LIQUID IN GLASS THERMOMETER
MANUFACTURER : PRECISION
MODEL : G13004
ID No : EQL-111
RESOLUTION : 1 °C
RECEIVED DATE : 18-Aug-21
AMBIENT TEMPERATURE : 23 °C ± 3 °C
SERIAL NUMBER : ---
TYPE : TOTAL IMMERSION
CALIBRATION DATE : 25-Aug-21
RELATIVE HUMIDITY : 50 %RH ± 20 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON ASTM E77:1992 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON ITS-90.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD THERMOMETER	1529	A22167	20T12169	10-Dec-21
2) SPRT PROBE	5612	587312	20T12169	10-Dec-21
3) PRECISION BATH	7320	A21105	20T12163	16-Dec-21

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	EMERGENT STEM TEMPERATURE (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
114.9054	115.0	110	-0.0946	N/A	0.14
120.9149	121.0	120	-0.0851	N/A	0.14

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 21H2269

Page : 1 of 2

Equipment : Dial Thermo-Hygrometer

Manufacturer: Barigo

Model : -

Serial No.: -

ID No.: EQL-064

Condition As-Received: Used Item

Received Date: 25 October 2021

Calibration Date: 27 October 2021
to 02 November 2021

Reference: 2110-0738DN

Ambient Temperature: (25 \pm 3) °C

Relative Humidity: (50 \pm 20) %

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.

Submitted by: TEST TECH CO.,LTD (HEAD Office)

30,32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	19714	20 Sep 2022
2) Standard Humidity/Temperature Meter	400	10240757	TH-0076-20	07 Dec 2021

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

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

- National Institute of Standards and Technology (NIST) , The United States of America
- National Institute of Metrology Thailand (NIMT)

Calibrated by : Viporn Tantiyawutti
Issue Date : 04 November 2021

Approved Signatory : _____

- ☒ Chakrit Waewanjua
☐ Pornthippa Tameyakul
☐ Pitak Srimongkol

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Cert. No.: 21H2269

Page.: 2 of 2

Result of Calibration:-

Function:

Without Adjustment

Humidity measurement.

<u>Reference</u> <u>Temperature</u> (°C)	<u>Standard</u> <u>Humidity</u> (%R.H.)	<u>UUC*</u> <u>Reading</u> (%R.H.)	<u>Error</u> (%R.H.)	<u>Uncertainty</u> <u>of Measurement</u> (±%R.H.)
25.0	30.1	30.0	-0.1	1.5
25.0	40.1	40.0	-0.1	1.5
25.0	50.1	51.0	0.9	1.7
25.0	60.0	61.0	1.0	1.7
25.0	75.2	76.0	0.8	1.7

Result of Calibration:-

Function:

Without Adjustment

Temperature measurement.

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
15.00	15.0	0.00	0.72
20.00	20.0	0.00	0.72
25.01	25.0	-0.01	0.72
30.01	30.0	-0.01	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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ใบรับรองการสอบเทียบ “เครื่องวัดความนำไฟฟ้า”
(Calibration Certificate of Conductivity Meter)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH120


Page.: 1 of 3

Certificate of Calibration

Equipment :	Conductivity Meter
Manufacturer :	TOA DKK
Model :	CM-41X
Serial No. :	842572
ID No. :	EQL-211
Condition As-Received:	Used Item
Received Date :	24 January 2022
Calibration Date :	26 January 2022
Reference :	2201-0646DN-1
Submitted by :	TEST TECH CO.,LTD (HEAD Office) 30,32 Rama II Soi 63, Rama II Rd., Samaedam, Bangkhunthian, Bangkok 10150
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure:	In -house method : - CP-CH6 by direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lerngagtrakul

Approved by :


Approved Signatory

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

Issue Date : 3 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0037370



Cert.No.: 22CH120

Page.: 2 of 3

Condition of this result of calibration**1. Reference Standard Instrument :-**

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1) Thermometer	1963878	130RC095	21I977	17 Sep 2022
2) Ref. Std. Thermometer	4982054	110RC044	21I1201	26 Oct 2022

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

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

2. Certified Reference Materials :-

- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Conductivity Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
147.0 $\mu\text{S/cm}$	CPA Chem	761020	02 Aug 2022
1.413 mS/cm	CPA Chem	761021	02 Aug 2022
12.8806 mS/cm	CPA Chem	754037	28 June 2022

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) $^{\circ}\text{C}$

3. This certificate is valid only to the item calibrated on date and place of calibration.**Calibration results****Function : Conductivity Measurement****(*) After Adjustment at 147.0, 1413.0, 12880.6 $\mu\text{S/cm}$** **Conductivity Electrode Serial No.: 806F0005**

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (\pm)	Coverage factor k
147.0 $\mu\text{S/cm}$	149.1 $\mu\text{S/cm}$	146.9 $\mu\text{S/cm}$	0.99 $\mu\text{S/cm}$	2.00
1.413 mS/cm	1.424 mS/cm	1.413 mS/cm	0.0092 mS/cm	2.00
12.8806 mS/cm	12.81 mS/cm	12.88 mS/cm	0.086 mS/cm	2.00

Remark**- UUC* = Unit Under Calibration****- 147.0 $\mu\text{S/cm}$ Adjustment Cell constant = 98.4m^{-1}** **- 1.413 mS/cm Adjustment Cell constant = 99.2m^{-1}** **- 12.8806 mS/cm Adjustment Cell constant = 100.7m^{-1}** *Mali*



Cert.No.: 22CH120

Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : CT-58101B
- Serial No. 806F0005

Dimension of probe;

- Length : 114 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)	Coverage factor k
25.0	25.003	25.1	0.097	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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ใบรับรองการสอบเทียบ "ตุ้มน้ำหนักมาตรฐาน"
(Calibration Certificate of Standard Weights)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 22M196

Page : 1 of 2

Equipment : Standard Weight
Manufacturer: LS
Model : -
Serial No.: -
ID No.: EQL-121
Condition As-Received: Used Item
Received Date: 03 February 2022
Calibration Date: 08 February 2022
Reference: 2202-0110DN
Ambient Temperature: (23 \pm 2) °C
Relative Humidity: (50 \pm 15) %
Atmospheric Pressure: 1011 mbar

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: TEST TECH CO.,LTD (HEAD Office)

30,32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weighings at an average air density of 1.2 kg/m³ and a temperature of 23 °C material density of weight is 8000 kg/m³.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Standard weight Set (E2)	YCS31-712-00	50202965	MM-0102-20	13 Jul 2022

2.This certificate is not certified for any commercial transaction.

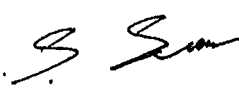
3.The certificate is valid only to the item calibrated on date and place of calibration.

4.This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwat Wutthicharoenmongkol
Issue Date : 08 February 2022

Approved Signatory :


[] Phalinee Prabpaipal
[x] Sura Suwannasri
[] Chaowalit Rittirak

B 0280632



Cert No.: 22M196

Page: 2 of 2

Result of calibration

Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement (\pm)	Maximum Permissible error (\pm)
50 g	50.00008 g	0.10 mg	0.30 mg

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

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[Signature]

a 1092727



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 21M1550

Page : 1 of 2

Equipment : Standard Weight
Manufacturer: -
Model: -
Serial No.: M 0030/11
ID No.: EQL-139
Condition As-Received: Used Item
Received Date: 25 August 2021
Calibration Date: 01 September 2021

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

Reference: 2108-0772WN
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1006 mbar

Submitted by: TEST TECH CO.,LTD (HEAD Office)

30,32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weighings at an average air density of 1.2 kg/m³ and a temperature of 23.0 °C material density of weight is 8000 kg/m³.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Standard weight Set (E2)	YCS31-712-00	50202965	MM-0102-20	13 Jul 2022

2.This certificate is not certified for any commercial transaction.

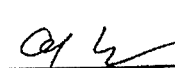
3.The certificate is valid only to the item calibrated on date and place of calibration.

4.This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Chaowalit Rittirak
Issue Date : 02 September 2021

Approved Signatory :


[☒] Phalinee Prabpaipal
[☐] Sura Suwannasri
[☐] Chaowalit Rittirak

R 0268026



Cert No.: 21M1550

Page: 2 of 2

Result of calibration

Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement (\pm)	Maximum Permissible error (\pm)
2 g	2.000024 g	0.040 mg	0.12 mg

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

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a 1064767



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 21M1549

Page : 1 of 2

Equipment : Standard Weight
Manufacturer: Mettler Toledo
Model :
Serial No.: 11119459
ID No.: EQL-149
Condition As-Received: Used Item
Received Date: 25 August 2021
Calibration Date: 01 September 2021

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

Reference: 2108-0772WN
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1006 mbar

Submitted by: TEST TECH CO.,LTD (HEAD Office)

30,32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weighings at an average air density of 1.2 kg/m³ and a temperature of 23.0 °C material density of weight is 8000 kg/m³.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Standard weight Set (E2)	YCS31-712-00	50202965	MM-0102-20	13 Jul 2022

2.This certificate is not certified for any commercial transaction.

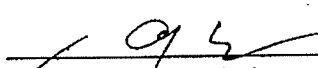
3.The certificate is valid only to the item calibrated on date and place of calibration.

4.This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Chaowalit Rittirak
Issue Date : 02 September 2021

Approved Signatory :


[☒] Phalinee Prabpaipal
[] Sura Suwannasri
[] Chaowalit Rittirak

B 0268025



Cert No.: 21M1549

Page: 2 of 2

Result of calibration

Without adjustment

Nominal Value	Conventional mass	Uncertainty of Measurement (\pm)	Maximum Permissible error (\pm)
20 g	20.000018 g	0.080 mg	0.25 mg

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

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ใบรับรองการสอบเทียบ “เครื่องวัดความขุ่น”
(Calibration Certificate of Turbidimeter)

Certificate of Calibration

Equipment:	TURBIDIMETER	Certificate No.:	C08210219
Model:	2100N	Issued Date:	11 November 2021
Serial No. (or ID.):	970400003415 (EQL-024)	Job No.:	KSPR2114482
Manufacturer:	HACH	Page:	1 of 2
Condition:	In Condition		

Customer: TEST TECH CO., LTD.
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkhuntien Bangkok 10150 Thailand

Environment Condition: Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

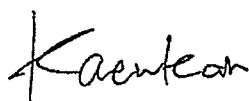
Calibration Place: Environment Laboratory, SPC RT Co., Ltd.
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,
Bangchak, Prakhonong, Bangkok 10260 Thailand

Calibration By: Miss. Kaewkan Suradech

Calibration Date: 11 November 2021

The Method used: In house method, SPCC-WI-23, base on Hach Manufacturer Method 8195

Traceability: This certificate is traceable to Primary standard Fromazin and StablCal accepted by
United States Environmental Protection Agency (EPA) through Hach Company
Certificate No. A1075 , A1074 , A1091 , A1074 , A1074



(Miss Kaewkan Suradech)

Person in charge

SERT
บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.



(Mr. Dumrong Boonsopon)

Authorized signatory

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

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

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

Calibration Results:

Before Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.050	0.055	-0.005	0.0005	0.070
20.40	18.8	1.60	0.05	1.0
205.0	196	9.0	0.0	10
1027.0	992	35.0	0.5	50
4020.0	3884	136.0	1.4	200

After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.050	0.058	-0.008	0.0004	0.070
20.40	20.4	0.00	0.00	1.0
205.0	205	0.0	0.0	10
1027.0	1027	0.0	0.0	50
4020.0	4018	2.0	0.8	200

The End of Certificate

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ใบรับรองการสอบเทียบ "เครื่องวัด pH"
(Calibration Certificate of pH Meter)



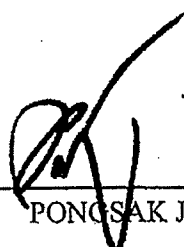
CERTIFICATE No : 22E0980
REFERENCE No : 63904-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : DKK-TOA
MODEL : HM-25R
SERIAL No : 760205
ID No : EQL-183
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : PRASERT P.
CALIBRATION DATE : 02-Feb-22

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 02-Feb-22

RECEIVED DATE : 02-Feb-22



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 22E0980

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : DKK-TOA
ID No : EQL-183
RECEIVED DATE : 02-Feb-22
AMBIENT TEMPERATURE : 25° C ± 1° C
MODEL : HM-25R
SERIAL NUMBER : 760205
CALIBRATION DATE : 02-Feb-22
RELATIVE HUMIDITY : 57 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READ THE VALUE COMPARED WITH CALCULATED VALUE. THE DISPLAY AND ELECTRODE WAS CALIBRATED BY USING STANDARD pH BUFFER SOLUTION.
2. REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) pH STANDARD SOLUTION	00651-06	CC719181	4880-12119147	05-Apr-23
2) pH STANDARD SOLUTION	00651-08	CC718727	4881-12110709	31-Mar-23
3) pH STANDARD SOLUTION	00651-10	CC717045	4882-12065386	17-Mar-23
4) PROCESS CALIBRATOR	744	7514008	21E1392	29-Apr-22
5) BATH	260014	1247 48074	21T9121	10-Sep-22
6) THERMOMETER WITH PROBE	421504	55000379	21T9129	14-Sep-22
7) STANDARD THERMOMETER	2560	A14546	PSL-T0049/64	23-Nov-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-
 - NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
 - NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. DISPLAY UNIT WITH pH ELECTRODE S/N: 002F0035MK

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	ACTUAL READING (mV)	UNCERTAINTY OF MEASUREMENT (± pH)	COVERAGE FACTOR k
4.007	4.01	-0.003	174	0.013	2.0
7.003	7.00	0.003	0.0	0.013	2.0
10.014	10.01	0.004	-172	0.014	2.0

2. DISPLAY UNIT MEASUREMENT TEMPERATURE WITH PROBE

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
25.003	25.1	80	-0.097	0.21

UUC : UNIT UNDER CALIBRATION

THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 21E11277
REFERENCE No : 63049-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : TOA DKK
MODEL : HM-41X
SERIAL No : 784787
ID No : EQL-199
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : PRASERT P.

CALIBRATION DATE : 15-Oct-21

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 15-Oct-21

RECEIVED DATE : 15-Oct-21



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 21E11277

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : TOA DKK
ID No : EQL-199
RECEIVED DATE : 15-Oct-21
AMBIENT TEMPERATURE : 25° C ± 1° C
MODEL : HM-41X
SERIAL NUMBER : 784787
CALIBRATION DATE : 15-Oct-21
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READ THE VALUE COMPARED WITH CALCULATED VALUE. THE DISPLAY AND ELECTROD WAS CALIBRATED BY USING STANDARD pH BUFFER SOLUTION.
2. REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) pH STANDARD SOLUTION	00651-06	CC719181	4880-12119147	05-Apr-23
2) pH STANDARD SOLUTION	00651-08	CC718727	4881-12110709	31-Mar-23
3) pH STANDARD SOLUTION	00651-10	CC717045	4882-12065386	17-Mar-23
4) PROCESS CALIBRATOR	744	7514008	21E1392	29-Apr-22
5) BATH	260014	1247 48074	21T9121	10-Sep-22
6) THERMOMETER WITH PROBE	421504	55000379	21T9129	14-Sep-22
7) STANDARD THERMOMETER	2560	A14546	PSL-T0049/64	23-Nov-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-
 - NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
 - NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT WITH pH ELECTRODE S/N: 903F0008MK

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	ACTUAL READING (mV)	UNCERTAINTY OF MEASUREMENT (± pH)	COVERAGE FACTOR k
4.007	4.01	-0.003	177	0.013	2.00
7.003	7.00	0.003	0	0.013	2.00
10.014	10.01	0.004	-177	0.014	2.00

2. DISPLAY UNIT MEASUREMENT TEMPERATURE WITH PROBE

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
25.008	25.0	80	0.008	0.21

UUC : UNIT UNDER CALIBRATION

THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

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ใบรับรองการสอบเทียบ “เครื่องวัดอุณหภูมิ-ความชื้นสัมพัทธ์”
(Calibration Certificate of Thermo - Hygrometer)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 21H2269

Page : 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: EQL-064
Condition As-Received: Used Item
Received Date: 25 October 2021
Calibration Date: 27 October 2021
to 02 November 2021
Reference: 2110-0738DN
Ambient Temperature: (25 \pm 3) °C
Relative Humidity: (50 \pm 20) %

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.

Submitted by: TEST TECH CO.,LTD (HEAD Office)

30,32 Rama II Soi 63, Rama II Rd., Samaedam,
Bangkhunthian, Bangkok 10150

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	19714	20 Sep 2022
2) Standard Humidity/Temperature Meter	400	10240757	TH-0076-20	07 Dec 2021

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

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

- National Institute of Standards and Technology (NIST) , The United States of America
- National Institute of Metrology Thailand (NIMT)

Calibrated by : Viporn Tantiyawutti
Issue Date : 04 November 2021

Approved Signatory :

- [☒] Chakrit Waewanjua
[☐] Pornthippa Tameyakul
[☐] Pitak Srimongkol



Cert. No.: 21H2269

Page.: 2 of 2

Result of Calibration:-

Function:

Without Adjustment

Humidity measurement.

<u>Reference</u> <u>Temperature</u> (°C)	<u>Standard</u> <u>Humidity</u> (%R.H.)	<u>UUC*</u> <u>Reading</u> (%R.H.)	<u>Error</u> (%R.H.)	<u>Uncertainty</u> <u>of Measurement</u> (±%R.H.)
25.0	30.1	30.0	-0.1	1.5
25.0	40.1	40.0	-0.1	1.5
25.0	50.1	51.0	0.9	1.7
25.0	60.0	61.0	1.0	1.7
25.0	75.2	76.0	0.8	1.7

Result of Calibration:-

Function:

Without Adjustment

Temperature measurement.

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
15.00	15.0	0.00	0.72
20.00	20.0	0.00	0.72
25.01	25.0	-0.01	0.72
30.01	30.0	-0.01	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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ใบรับรองการสอบเทียบ “ตู้อบ”
(Calibration Certificate of Oven)



CERTIFICATE No : 21T9567/1
REFERENCE No : 62575-5

PAGE : 1 OF 2

Certificate of Calibration

THIS CALIBRATION CERTIFICATE WAS ISSUED TO SUPPLEMENT CALIBRATION CERTIFICATE NO.21T9567
EQUIPMENT : HOT AIR OVEN

MANUFACTURER : MEMMERT

MODEL : UFE 500

SERIAL No : G 512.2005

ID No : EQL-161

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 23-Sep-21

APPROVED BY : PONGSAK J.

ISSUED DATE : 05-Oct-21

RECEIVED DATE : 23-Sep-21



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 21T9567/1

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UFE 500
ID No : EQL-161
RECEIVED DATE : 23-Sep-21
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : G 512.2005
CALIBRATION DATE : 23-Sep-21
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

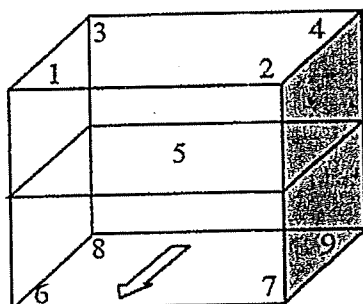
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	HYDRA 2635A	6635300	21T6765	10-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



FRONT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 4
Overall Line Voltage (V) variation : 9
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*48 cm; Vent =50%

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.5	104.5	104.12	0.16	0.62	0.76
120.0	120.5	120.5	120.10	0.17	0.70	0.84
140.0	140.5	140.5	140.10	0.22	0.80	1.04
150.0	150.5	150.5	150.03	0.25	0.96	1.20

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.5	104.5	104.00	104.30	104.25	103.92	103.97	103.92	103.98	104.23	104.48	0.38
120.5	120.5	119.92	120.33	120.24	119.88	119.91	119.83	120.04	120.21	120.51	0.38
140.5	140.5	139.90	140.32	140.27	139.79	139.93	139.79	139.93	140.29	140.63	0.46
150.5	150.5	149.84	150.24	150.13	149.81	149.85	149.72	149.78	150.25	150.68	0.46

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.
NOTE 2: LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT




CERTIFICATE No : 21T9568
REFERENCE No : 62575-6

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UF 110
SERIAL No : B414.0764
ID No : EQL-169
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 23-Sep-21

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 27-Sep-21

RECEIVED DATE : 23-Sep-21



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 21T9568

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UF 110
ID No : EQL-169
RECEIVED DATE : 23-Sep-21
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : B414.0764
CALIBRATION DATE : 23-Sep-21
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

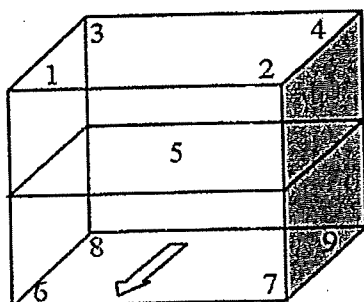
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	HYDRA 2635A	7301307	21T6764	10-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



FRONT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2
Overall Line Voltage (V) variation : 8
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*48 cm; Vent =50%

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	104.0	103.89	0.21	0.91	0.93
180.0	180.0	180.0	179.74	0.36	1.82	2.11

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	104.32	104.08	103.67	103.89	103.58	103.73	104.04	103.73	103.93	0.38
180.0	180.0	180.38	179.92	179.16	179.40	179.25	179.24	180.76	179.13	180.37	1.1

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2: LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



CERTIFICATE No : 21T9566
REFERENCE No : 62575-4

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UFE 500
SERIAL No : G508.0791
ID No : EQL-128
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 23-Sep-21

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 27-Sep-21

RECEIVED DATE : 23-Sep-21



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkoe, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 21T9566

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UFE 500
ID No : EQL-128
RECEIVED DATE : 23-Sep-21
AMBIENT TEMPERATURE : 25 °C ± 1 °C
S/N : G508.0791
CALIBRATION DATE : 23-Sep-21
RELATIVE HUMIDITY : 51 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

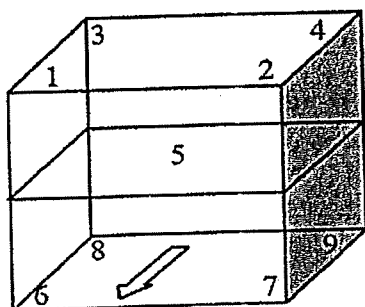
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	HYDRA 2635A	6635300	21T6765	10-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



FRONT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2
Overall Line Voltage (V) variation : 5
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*48 cm; Vent =50%

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	104.0	104.09	0.19	0.98	1.23
180.0	180.0	180.0	180.10	0.42	1.68	2.30

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	104.03	103.61	104.24	103.79	103.77	104.04	104.45	104.56	104.34	0.38
180.0	180.0	179.70	179.20	180.24	179.24	179.57	180.43	180.86	180.89	180.73	1.1

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2: LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

ใบรับรองการสอบเทียบ “เครื่องชั่ง”

(Calibration Certificate of Electronic Balance)



CERTIFICATE No : 21M9564
REFERENCE No : 62575-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BP210S
SERIAL No : S0736477
ID No : EQL-008
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD.,
SAMAEDAM, BANGKHUNTHIAN, BANGKOK
10150

CALIBRATED BY : PRASERT P.

CALIBRATION DATE : 23-Sep-21

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 27-Sep-21

RECEIVED DATE : 23-Sep-21



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 21M9564

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BP210S
MANUFACTURER : SARTORIUS S/N : S0736477
ID No : EQL-008 RECEIVED DATE : 23-Sep-21
AIR PRESSURE : 1010mbar \pm 1mbar CALIBRATION DATE : 23-Sep-21
AMBIENT TEMPERATURE : 25°C \pm 1°C RELATIVE HUMIDITY : 51 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING INTERNAL WEIGHT TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN. THE INTERNAL WEIGHT WAS CHECKED BY USING

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	C02210415	09-Feb-23
2) STANDARD WEIGHT	E2	15843	C02210419	10-Feb-23
3) STANDARD WEIGHT	E2	QK-I-349	M2103235S	26-Mar-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

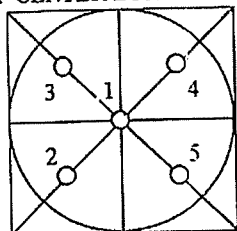
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000048 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.000	0.0000	0.0000	0.000078
0.100	0.1000	0.0000	0.000078
0.20	0.2000	0.0000	0.000078
1.0	1.0000	0.0000	0.000079
2.0	2.0000	0.0000	0.000080
20.0	19.9999	0.0001	0.000089
45.0	44.9999	0.0001	0.00014
65.0	64.9999	0.0001	0.00016
80.0	79.9999	0.0001	0.00019
100.0	99.9998	0.0002	0.00019
120.0	119.9998	0.0002	0.00022
140.0	139.9998	0.0002	0.00025
160.0	159.9998	0.0002	0.00027
180.0	179.9999	0.0001	0.00030
200.0	199.9995	0.0005	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	99.9997
2	99.9996
3	99.9994
4	99.9998
5	99.9997
OFF-CENTER LOADING	0.0003

6. INTERNAL WEIGHT ERROR : 0.000400000000013279 g

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

ใบรับรองการสอบเทียบ “ห้องเย็น”
(Calibration Certificate of Cool Room)



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 , +669 8247 2360

Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th



Certificate No. T220021

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room) .

Manufacturer : -

Model : -

Serial No. : -

Customer Code : EQL-167

ID No. : T1447A1

Customer : Test Tech Co.,Ltd

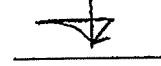
30, 32 Rama II Soi 63, Rama II Rd., Samaedam,

Bangkhunthian Bangkok 10150

Customer Location : LABORATORY FLOOR 3

Date of Receipt : 12 January 2022

Calibrated By : Watcharapon Sangtong (Technician)

Approved By :  / Sujjar Naknakred (Site Calibration Manager)

Date of Issue : 19 JAN 2022

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.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T220021

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)
Date of Calibration : 19 January 2022
Environment : Temperature : 24.2-26.8 °C
Line Voltage : 221.6-225.5 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. 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 (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
TC	TYPE T	TN161-TN170	T210009	31 January 2022
DATA LOGGER	34970A	T149	T210009	31 January 2022

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 1 Hour 30 Minute At 3 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment

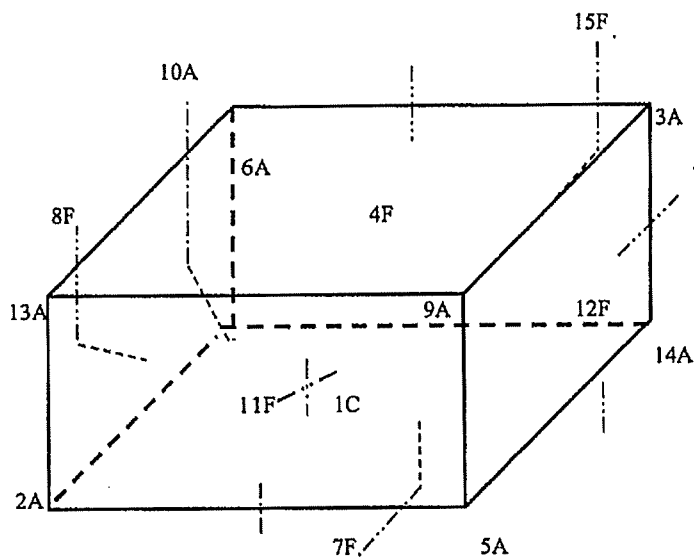
(X) after adjustment

Approved By. 

Certificate No. T220021

Page 3 of 4

Calibration Report



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

1C	=	TN161
2A	=	TN162
3A	=	TN163
4F	=	TN164
5A	=	TN165
6A	=	TN166
7F	=	TN167
8F	=	TN168
9A	=	TN169
10A	=	TN170

11F	=	TN171
12F	=	TN172
13A	=	TN173
14A	=	TN174
15F	=	TN175

Approved By. _____



Certificate No. T220021

Page 4 of 4

Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
3	3.15	3.01	3.03	3.25	3.15	3.32	3.15	2.50	3.02	2.93
	TN171	TN172	TN173	TN174	TN175					
	2.99	2.47	2.60	2.95	2.60					

Chamber (Cooling Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage
	Min , Max	Average					Factor <i>k</i>
3.0	2.9 , 3.1	3.0	2.94	0.47	1.02	0.93	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 % .

Approved By. 



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 , +669 8247 2360

Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th



Certificate No. T220242

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cooling Room)

Manufacturer : -

Model : -

Serial No. : -

Customer Code : EQL-181

ID No. : T0399A5

Customer : Test Tech Co.,Ltd

30, 32 Rama II Soi 63, Rama II Rd., Samaedam,

Bangkhunthian Bangkok 10150

Customer Location : LABORATORY FLOOR 4

Date of Receipt : 3 February 2022

Calibrated By : Watcharasak Puttarat (Technician)

Approved By : [Signature] / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 21 FEB 2022

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.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T220242

Page 2 of 4

Calibration Report

Equipment : Chamber (Cooling Room)
Date of Calibration : 7 February 2022
Environment : Temperature : 16.4-17.9 °C
Line Voltage : 221.4-230.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 15 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 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN141-TN150	T210743	21 April 2022
TC	TYPE T	TN151-TN160	T210743	21 April 2022
DATA LOGGER	34970A	T150	T210743	21 April 2022

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 20 Minute At 3 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

(X) without adjustment

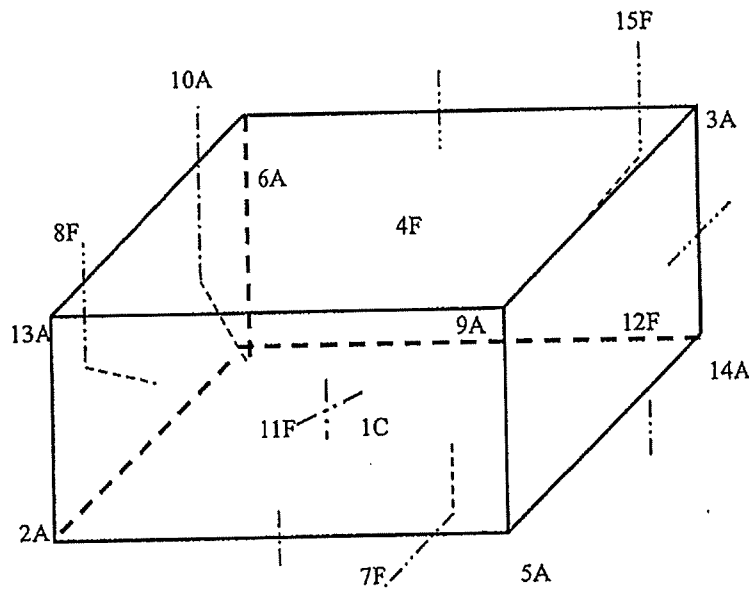
() after adjustment

Approved By

Certificate No. T220242

Page 3 of 4

Calibration Report



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

1C	=	TN141
2A	=	TN142
3A	=	TN143
4F	=	TN144
5A	=	TN145
6A	=	TN146
7F	=	TN147
8F	=	TN148
9A	=	TN149
10A	=	TN150
11F	=	TN151

12F	=	TN152
13A	=	TN153
14A	=	TN154
15F	=	TN155

Approved By. 



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T220242

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150
3.0	3.03	2.89	2.89	3.39	2.90	3.05	3.02	3.00	2.89	3.13
	TN151	TN152	TN153	TN154	TN155					
	3.23	3.20	3.25	2.93	3.17					

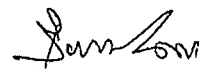
Chamber (Cooling Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (\pm °C)	Uniformity (°C)	Uncertainty (\pm °C)	Coverage Factor <i>k</i>
	Min, Max	Average					
3.0	2.7, 3.3	3.0	3.07	1.09	1.30	1.50	2.00

* The Acuoted 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 multiplid by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By. 

หน้า 10

ใบรับรองการสอบเทียบ “ตู้บ่มเชื้อ”
(Calibration Certificate of Incubator)



QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 21T8205
REFERENCE No : 62206-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : ---
MODEL : ---
SERIAL No : ---
ID No : EQL-166
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : TETNITHI W.

CALIBRATION DATE : 24-Aug-21

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 24-Aug-21

RECEIVED DATE : 24-Aug-21



CERTIFICATE No : 21T8205

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : ---
ID No : EQL-166
RECEIVED DATE : 24-Aug-21
AMBIENT TEMPERATURE : 24 °C ± 1 °C
MODEL : ---
SERIAL NUMBER : ---
CALIBRATION DATE : 24-Aug-21
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 13 POINTS AND LOCATED AS THE PICTURE BELOW AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE SEVENTH THERMOCOUPLE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	7903007	21T6763	05-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

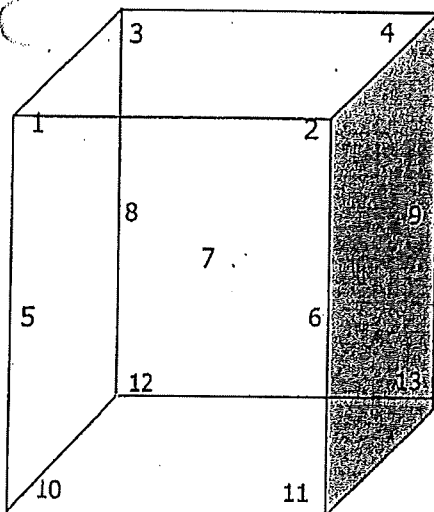
RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 0
Overall Line Voltage (V) variation : 3
Instrument Condition : Normal
Chamber Size (W*L*H): 190*70*170 cm

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.0	20.0	19.8	0.0	0.4	0.5



FRONT

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller temperature (°C)	20.0
Indicating Temperature	20.0
Measured Temperature (°C) at Spread Locations	1
	2
	3
	4
	5
	6
	7 Ref.
	8
	9
	10
	11
	12
	13
Uncertainty of Measurement (± °C)	0.48

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 7 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

[Signature]



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



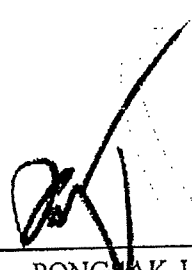
PAGE : 1 OF 2

CERTIFICATE No : 22T1725
REFERENCE No : 64109-1

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 110
SERIAL No : D415.0802
ID No : EQL-190
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 21-Feb-22

APPROVED BY : 
PONGSAK J.
ISSUED DATE : 22-Feb-22
RECEIVED DATE : 21-Feb-22



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkac, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 22T1725

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 110
ID No : EQL-190
RECEIVED DATE : 21-Feb-22
AMBIENT TEMPERATURE : 24 °C ± 1 °C
S/N : D415.0802
CALIBRATION DATE : 21-Feb-22
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

2. REFERENCE STANDARD INSTRUMENTS :-

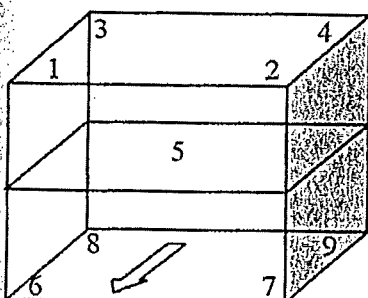
INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	HYDRA 2635A	7408027	21T6766	10-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



FRONT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 5
Overall Line Voltage (V) variation : 8
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*48 cm

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
37.0	37.0	37.0	36.91	0.07	0.22	0.28
44.0	44.0	44.0	44.17	0.07	0.22	0.27

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
37.0	37.0	36.97	36.95	36.84	36.96	36.94	36.92	36.91	36.90	36.84	0.25
44.0	44.0	44.21	44.23	44.09	44.23	44.23	44.13	44.21	44.15	44.07	0.36

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



QUALITY CALIBRATION CO.,LTD.

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PAGE : 1 OF 2


CERTIFICATE No : 22T1726
REFERENCE No : 64109-2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
SERIAL No : D518.0082
ID No : EQL-205
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 21-Feb-22

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 22-Feb-22

RECEIVED DATE : 21-Feb-22



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 22T1726

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : IF 160
ID No : EQL-205
RECEIVED DATE : 21-Feb-22
AMBIENT TEMPERATURE : 24 °C ± 1 °C
S/N : D518.0082
CALIBRATION DATE : 21-Feb-22
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

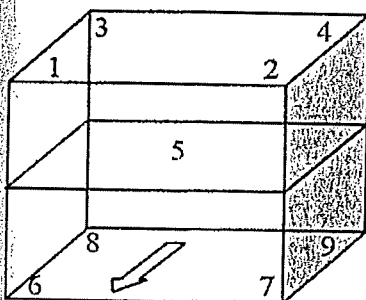
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	HYDRA 2635A	6635300	21T6765	10-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



FRONT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2
Overall Line Voltage (V) variation : 9
Instrument Condition : Normal
Chamber Size (W*L*H): 56*40*72 cm

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	34.99	0.02	0.14	0.20
36.0	36.0	36.0	36.00	0.03	0.14	0.22
41.5	41.5	41.5	41.46	0.05	0.10	0.19

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
35.0	35.0	34.91	34.94	34.93	34.93	34.98	35.03	35.08	35.01	35.08	0.25
36.0	36.0	35.93	35.95	35.95	35.94	36.00	36.05	36.10	36.01	36.10	0.25
41.5	41.5	41.46	41.47	41.41	41.47	41.50	41.47	41.45	41.43	41.49	0.36

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 21T7075
REFERENCE No : 61873-3


PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : INB 400
SERIAL No : E405.0946
ID No : EQL-087
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 20-Jul-21

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 21-Jul-21

RECEIVED DATE : 20-Jul-21



CERTIFICATE No : 21T7075

PAGE : 2 OF 2

Calibration Report.

EQUIPMENT : INCUBATOR
MANUFACTURER : MEMMERT
MODEL : INB 400
ID No : EQL-087
RECEIVED DATE : 20-Jul-21
AMBIENT TEMPERATURE : 24 °C ± 1 °C
S/N : E405.0946
CALIBRATION DATE : 20-Jul-21
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

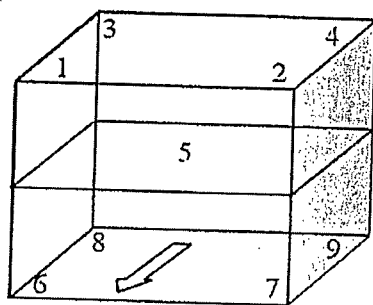
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	HYDRA 2635A	7301307	21T6764	10-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



FRONT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1
Overall Line Voltage (V) variation : 9
Instrument Condition : Normal
Chamber Size (W*L*H): 40*33*40 cm

CHAMBER PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.0	43.5	43.5	44.15	0.17	1.25	1.27
55.0	54.5	54.5	55.06	0.27	1.47	1.50

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
43.5	43.5	43.75	43.82	43.87	43.82	43.62	44.62	44.52	44.61	44.68	0.36
54.5	54.5	54.63	54.67	54.77	54.68	54.46	55.47	55.64	55.52	55.67	0.36

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.
NOTE 2 : LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

OK

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ใบรับรองการทวนสอบ “เครื่อง Atomic Absorption Spectrophotometer”
(Calibration Certificate of Atomic Absorption Spectrophotometer)



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

ATOMIC ABSORPTION SPECTROMETER TEST CERTIFICATE

Certificate No : SV2112/20032

Instrument Type : Atomic Absorption Spectrophotometers

Model : AA240FS

Serial Number : EL08043418

Organization : Test Tech Co., Ltd.

Address : 30.32 Rama II Soi 63 Rd. Samaedam Bangkhuntien, Bangkok 10150

Date : 15 Dec 2021

Hollow cathode lamps used

Element	Lamp number	Comments
Arsenic	56-101003-00	
Copper	56-101014-00	
Potassium	56-101042-00	
Iron	56-101027-00	
Manganese	56-101337-00	

Test description	Specification	Result	Comments
Light throughput (%Gain) or (EHT)			
Cu at 324.8 nm	$\leq 64 \%$ or 380 V	32 %	Pass
As at 193.7 nm	$\leq 80 \%$ or 540 V	55 %	Pass
K at 766.5 nm*	$\leq 84 \%$ or 540 V	64 %	Pass
Fe at 248.3 nm	$\leq 80 \%$ or 540 V	64 %	Pass
Mn at 279.5 nm	$\leq 64 \%$ or 380 V	48 %	Pass
Photometric noise Cu BGC off			
STDV @ 0 Abs	≤ 0.0005	0.0000	Pass



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

Wavelength accuracy			
Cu at 324.8 nm	323.0 nm – 326.0 nm	324.7 nm	Pass
As 193.7 nm	192.0 nm – 195.0 nm	193.7 nm	Pass
K at 766.5 nm*	765.0 nm – 768.0 nm	766.4 nm	Pass
Fe at 248.3 nm	246.8 nm - 249.8 nm	248.2 nm	Pass
Mn at 279.5 nm	278.0 nm - 281.0 nm	279.5 nm	Pass
High solids nebulizer setting**			
Uptake rate	7.2 – 10.6 ml / min	7.5 ml/min	Pass
Max Abs	≥ 0.75 Abs	0.76 Abs	Pass
Precision(%RSD)	≤ 0.5 %	0.5 %	Pass
Zeeman Background Correction Accuracy (%)***			
BCA @ Au 242.8 nm	< 3.7 %	***	***
Zeeman Magnetic Sensitivity Ratio (%)***			
MSR @ Cu 324.7 nm	> 70 %	***	***
Characteristic mass and sensitivity ****			
Sensitivity	≥ 0.21 Abs	****	****
Precision (%RSD)	≤ 4.0 %	****	****

** for Flame system

*** for Zeeman system

**** for Graphite furnace system

CALIBRATED BY :

Signature: 

Engineer : Suriya Nacharoen

Date : 15 / Dec / 2021



APPROVED BY :

Signature: 

Service Manager Suchai Sanguanklattichai

Date : 15 / Dec / 2021



MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 100&FIAS

Customer : บริษัท เทสท์ เทคโนโลยี จำกัด	Date Tested: 18-ส.ค.-21
Address : 30,32 ซอยพระรามที่ 2 ซอย 63 ถนนพระราม2, เขตบางขุนเทียน, กรุงเทพฯ 10150	Recommendation Recertification Period 12 Months Recertification Due: 17-ส.ค.-22 Date Last Certified: 26-ส.ค.-20
User Name: คุณ อ้อยใจ สระจันทร์	Visit Number: 1 OF 1
Phone: 02-8934211-7	Mobile Phone 081-7316733
E-mail: Aoyny_999@hotmail.com	E-Mail thonesource@gmail.com

CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
AAAnalyst 100	040S0020203	AA WinLab Version 3.2
FIAS 200 (EQL-052)	2671	

TEST STANDARD USED	LOT NUMBER	EXPIRATION DATE
MERCURY	S191106032	14-ก.ย.-21
ARSENIC	S190916002	16-ก.ย.-21
SELENIUM	S200302006	14-ก.ย.-21
FILTER 0.2 %	MGO-057	



MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 100&FIAS

SERIAL NUMBER 040S0020203

DATE TESTED

18-ส.ค.-21

1. OPTIC CHECKS

A. Optical alignment condition (if necessary)

☐ OK

B. Condition of Mirrors, Lenses etc.

☐ OK

2. ELECTRONICS CHECKS

A. Power Supplies

+ 5.00 Vdc \pm 0.2 Vdc

+ 5.01 Vdc

+ 12.00 Vdc \pm 1.0 Vdc

+ 11.3 Vdc

+ 15.00 Vdc \pm 1.0 Vdc

+ 15.0 Vdc

- 15.00 Vdc \pm 1.0 Vdc

- 15.0 Vdc

+ 35.00 Vdc \pm 3.5 Vdc

+ 32.2 Vdc

B. High Voltage

1000 VAC \pm 75 VAC

1003 VAC

3. FIAS CHECKS

A. Output power supplies

+5 VDC \pm 0.5 VDC.

+4.9 Vdc

+15 VDC \pm 1.0 VDC.

+14.80 Vdc

- 15.00 Vdc \pm 1.0 Vdc

-14.90 Vdc

B. 5 Port Valve & Pump

☐ OK

C. Check Flow Meter

☐ OK

4. WAVELENGTH ACCURACY TEST

A. Ni Lamp wavelength 303.8 nm \pm 0.3 nm.

303.86 nm.

B. Cu Lamp wavelength 324.8 nm \pm 0.3 nm.

324.85 nm.

C. As Lamp wavelength 193.7 nm \pm 0.3 nm.

193.58 nm.

D. K Lamp wavelength 766.5 nm \pm 0.3 nm.

766.38 nm.

E. Zn Lamp wavelength 213.9 nm \pm 0.3 nm.

213.80 nm.



MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 100&FIAS

SERIAL NUMBER 040S0020203

DATE TESTED 18-ส.ค.-21

PARAMETER	SPECIFICATION	ACTUAL VALUE
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5. PERFORMANCE TESTS

A. Neutral density filter checks with Copper (324.8 nm)

Neutral Density Filter 0.2	<u>0.1713</u> $\pm 10\%$	<u>0.182</u> Abs.
----------------------------	--------------------------	-------------------

B. AA Baseline noise test with Copper (324.8 nm)

Integration time = 0.5 seconds

Replicates = 99 times

SD ≤ 0.005 Results 0.000

C. PERFORMANCE TEST FOR FIAS

ACTUAL VALUE

1. Characteristic mass for Mercury

(500 ul of 10 ug/l for Hg and 3 replicates)

Characteristic Mass	<u>0.068</u> Abs.
	<u>349.2</u> pg/0.0044 Abs.

% RSD	<u>3.90</u> %
-------	---------------

2. Characteristic mass for Arsenic

(500 ul of 10 ug/l for As and 3 replicates)

Characteristic Mass	<u>0.161</u> Abs.
	<u>136.6</u> pg/0.0044 Abs.

% RSD	<u>2.22</u> %
-------	---------------

3. Characteristic mass for Selenium

(500 ul of 10 ug/l for Se and 3 replicates)

Characteristic Mass	<u>0.317</u> Abs.
	<u>71.0</u> pg/0.0044 Abs.

% RSD	<u>0.32</u> %
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MAINTENANCE REPORT

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 100&FIAS

SERIAL NUMBER 040S0020203DATE TESTED 18-ส.ค.-21

Remarks :

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.

Service Department TH One Source Co., Ltd.

Krungchai T.

(Krungchai Treevichien)

Customer Support Engineer



MAINTENANCE AND IPV TEST CERTIFICATE MODEL OPTIMA 8000

Customer : <u>บริษัท เทสท์ เทคโนโลยี จำกัด</u> Address : <u>30,32 ซอยพระรามที่ 2 ซอย 63</u> <u>ถนนพระรามที่ 2 แขวงสามตา</u> <u>เขตบางขุนเทียน กรุงเทพฯ 10150</u> User Name: <u>คุณอ้อยใจ สระจันทร์</u> Phone: <u>02-893-4211-17</u> Email: <u>aony 999@hotmail.com</u>	Date Tested: <u>May 21, 2021</u> Recommendation Recertification Period <u>12</u> <u>Months</u> Recertification Due: <u>May 20, 2022</u> Date Last Certified: <u>November 24, 2020</u> Visit Number: <u>1 of 1</u> PerkinElmer Phone: <u>02-719-6420 ext 206</u> PerkinElmer Fax: <u>02-318-5597</u>
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CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 8000</u>	<u>078S1411171C</u>	<u>WinLab32 Version 5.5.0.0714</u>
<u>N0772045</u>	<u>2F1441085</u>	<u>PN:6150T21E4Q1E</u>
<u>EQL-180</u>		
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Mixed standard 1/10</u>	<u>N069-1579</u>	<u>NOV 30, 2021</u>
<u>Mixed standard 1/100</u>	<u>N930-0221</u>	<u>JUN 30, 2021</u>
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



**MAINTENANCE AND IPV TEST CERTIFICATE MODEL
OPTIMA 8000**

SERIAL NUMBER : 078S1411171C

DATE TESTED : May 21, 2021

1. MECHANICAL CHECKS

- A. Inspect and clean all fans and filters.
- B. Inspect and replace as necessary, all torch components including the RF coil.
- C. Inspect all tubing for sign of clacking or leaking.
- D. Adjust water and gas pressure regulator settings.
- E. Inspect and leak check pneumatics drawers.
- F. Clean the exterior of the instrument.

☐ OK☐ OK☐ OK☐ OK☐ OK☐ OK**2. OPTICAL CHECKS**

- A. Inspect and clean all optical components.
- B. As required, check and replace all purge filters.
- C. Recheck optical alignment.

☐ OK☐ OK☐ OK**3. COOLING SYSTEM CHECKS**

- A. Perform preventive maintenance on chiller.
- B. Flush out the chiller every six months.

☐ OK☐ OK**4. PERFORMANCE CHECKS**

- A. Torch View Alignment.
- B. Wavelength Calibration.

☐ OK☐ OK

MAINTENANCE AND IPV TEST CERTIFICATE MODEL OPTIMA 8000

SERIAL NUMBER : 078S1411171C

DATE TESTED : May 21, 2021

PARAMETER	SPECIFICATION			FINAL VALUE
Spectral Resolution : UV	As 193.696 nm	≤ 0.009		<u>0.00702</u> nm
	Ni 231.604 nm	≤ 0.011		<u>0.00855</u> nm
	Ni 341.476 nm	≤ 0.015		<u>0.01304</u> nm
Spectral Resolution : VIS	Ba 455.403 nm	≤ 0.020		<u>0.01682</u> nm
Precision				
	Zn 206.200 nm	% RSD ≤ 1.0		<u>0.21</u> %
	Mg 280.271 nm	% RSD ≤ 1.0		<u>0.16</u> %
	Mg 285.213 nm	% RSD ≤ 1.0		<u>0.39</u> %
	Ba 455.403 nm	% RSD ≤ 1.0		<u>0.17</u> %
Detection Limits : Axial	As 193.696 nm	3(SD) ppb ≤ 10.0 ppb		<u>2.81</u> ppb
	Se 196.026 nm	3(SD) ppb ≤ 5.0 ppb		<u>2.58</u> ppb
	Tl 190.801 nm	3(SD) ppb ≤ 10.0 ppb		<u>0.75</u> ppb
	Pb 220.353 nm	3(SD) ppb ≤ 3.0 ppb		<u>1.26</u> ppb
Detection Limits : Radial	As 193.696 nm	3(SD) ppb ≤ 60.0 ppb		<u>7.86</u> ppb
	Zn 213.857 nm	3(SD) ppb ≤ 2.0 ppb		<u>0.40</u> ppb
	Mn 257.610 nm	3(SD) ppb ≤ 1.0 ppb		<u>0.17</u> ppb
	La 379.478 nm	3(SD) ppb ≤ 3.0 ppb		<u>0.17</u> ppb
	Ba 455.403 nm	3(SD) ppb ≤ 0.3 ppb		<u>0.14</u> ppb
	Ba 493.408 nm	3(SD) ppb ≤ 0.6 ppb		<u>0.11</u> ppb
BEC : Axial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 30 ppb		<u>7.47</u> ppb
BEC : Radial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 30 ppb		<u>15.47</u> ppb

MAINTENANCE REPORT AND IPV TEST CERTIFICATE
OPTIMA 8000

SERIAL NUMBER : 078S1411171C

DATE TESTED : May 21, 2021

Remarks :

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed and the configuration tested

☒

meets

☐

does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,
including warranty terms.

Service Department PerkinElmer Ltd.

Authorized Representative :

Kh. S.

(Khwanchai Siangwong)

Senior Customer Support Engineer

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ใบรับรองการทวนสอบ “เครื่องอ่างไอน้ำ”

(Calibration Certificate of Water bath)



CERTIFICATE No : 21T8207
REFERENCE No : 62206-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH

MANUFACTURER : MEMMERT

MODEL : WNE45

SERIAL No : L720.0266


ID No : EQL-241

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD., SAMAEDAM,
BANGKHUNTHIAN, BANGKOK 10150

CALIBRATED BY : TETNITHI W.

CALIBRATION DATE : 24-Aug-21

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 24-Aug-21

RECEIVED DATE : 24-Aug-21



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 21T8207

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : EQL-241
RECEIVED DATE : 24-Aug-21
AMBIENT TEMPERATURE : 29 °C ± 1 °C
MODEL : WNE45
SERIAL NUMBER : L720.0266
CALIBRATION DATE : 24-Aug-21
RELATIVE HUMIDITY : 56 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.

2. REFERENCE STANDARD INSTRUMENTS :-

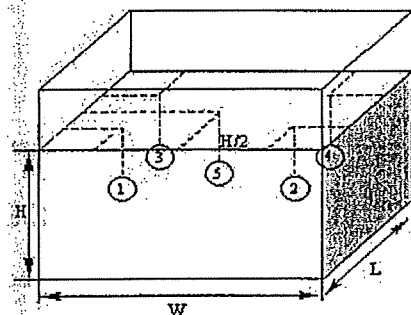
INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	2625A	6603614	21T6761	05-Jul-22

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.6
Overall Variation of Line Voltage (V) : 5
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 59*35*22 cm

BATH PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
83.0	83.0	83.0	83.32	0.19	0.06	0.39
92.0	92.0	92.0	92.34	0.22	0.26	0.57

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
83.0	83.0	83.31	83.32	83.35	83.32	83.29	0.26
92.0	92.0	92.30	92.51	92.25	92.37	92.28	0.29

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE BATH.

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

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ใบรับรองการทวนสอบ “เครื่องนึ่งฆ่าเชื้อ”
(Calibration Certificate of Autoclave)



CERTIFICATE No : 22T1730
REFERENCE No : 64109-6

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : AUTOCLAVE
MANUFACTURER : HIRAYAMA
MODEL : HVE-50
SERIAL No : 30612085166
ID No : EQL-155
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : TEST TECH CO., LTD.
30,32 RAMA II SOI 63, RAMA II RD.,
SAMAEDAM, BANGKHUNTHIAN, BANGKOK
10150

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 21-Feb-22

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 22-Feb-22

RECEIVED DATE : 21-Feb-22



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 22T1730

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : AUTOCLAVE
MANUFACTURER : HIRAYAMA
ID NUMBER : EQL-155
RECEIVED DATE : 21-Feb-22
AMBIENT TEMPERATURE : 30° C ± 1° C
MODEL : HVE-50
SERIAL NUMBER : 30612085166
CALIBRATION DATE : 21-Feb-22
RELATIVE HUMIDITY : 50 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON BS 2646 : Part 5 : 1993 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON FIVE LOCATIONS AS SHOWN IN THE PICTURE. TWO PROBES WERE PLACES NEAR TOP AND BOTTOM WALL AND EACH PROBE WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE THIRD PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE INSTRUMENT CHAMBER. PROBE NUMBER 4 WAS ATTACHED TO THE LOAD TEMPERATURE PROBE, IF FITTED, WITHIN 20 mm OF ITS TIP. PROBE NUMBER 5 WAS PLACED IN THE CHAMBER DRAIN OR VENT WITHIN 100 mm OF ITS CONNECTION TO THE CHAMBER.
2. REFERENCE STANDARD INSTRUMENTS :-

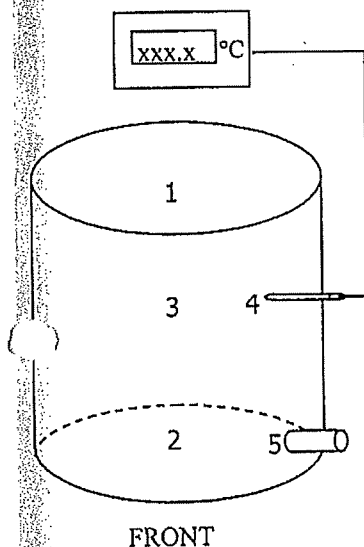
INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER	VALPROBE	S350, DV35, DN94	22T0541	31-Jan-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



GENERAL INFORMATION

Overall Ambient Temperature around the Chamber variation : 1.2 °C
Autoclave Condition : Normal
Chamber Size (Diameter*H): 30 * 71 cm

CHAMBER PERFORMANCE

Controller Temperature (°C)	Average All Locations (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)	Pressure (MPa)	Holding time (min)	Operating Cycle time (min)
116	116.48	0.09	0.10	0.27	0.090	15	60
122	122.43	0.09	0.13	0.27	0.130	15	60

TEMPERATURE MEASUREMENT ACCURACY TEST(° C)

Cont Temp	Ind Temp	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	#5	
116	116	116.45	116.50	116.53	116.45	116.45	0.59
122	122	122.40	122.46	122.50	122.39	122.39	0.59

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT OF TEMPERATURE MEASUREMENT ACCURACY TEST EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : THE STABILITY TERM IN THE UNCERTAINTY BUDGET WAS REPLACED BY THE STANDARD REPEATABILITY.

NOTE 3 : LOCATION 3 WAS REFERENCE LOCATION.

NOTE 4 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

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ใบรับรองการทวนสอบ “เครื่อง Spectrophotometer”
(Calibration Certificate of Spectrophotometer)



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor7 Rama4 Road
Silom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Number of Page(s)

1 of 3

Certificate No.	BSCC-UV-170/21
Equipment	UV/Vis Spectrophotometer
Model	UV-1900i
Manufacturer	Shimadzu
Serial No.	A12535780311ML
ID No.	EQL-233
Date of receipt	7 June 2021
Date of calibration	7 June 2021
Date of issue	11 June 2021
Customer name	Test Tech Co., Ltd.
Address	30,32 Rama II Soi 63, Rama II Rd., Samaedam, Bangkhunthian, Bangkok 10150
Temperature	(23.8 - 25.2) °C (On site)
Humidity	(48.6 - 53.6) %RH (On site)
Equipment condition	Good Operation
Calibration Location	Water Room
Calibration Procedure	In-house method WI-UV-702-01 based on ASTM E275-01
Traceability	Wavelength Accuracy is traceable to certificate No. 80172 and 78888 Photometric Accuracy is traceable to certificate No. 80162 and 78898 Stray Light is traceable to certificate No. 78900 The above certificate are traceable to SI unit through Starna Scientific Ltd. (UKAS accredited calibration laboratory NO. 0659)
Calibrated by	Mr.Wanchana Janloey

Approved by

Mr.Kanchit Choothep
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.

Certificate of Calibration

Certificate No. BSCC-UV-170/21

Number of Page(s) 2 of 3

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (\pm nm)
279.44	279.07	-0.37	0.18
418.53	418.41	-0.12	0.18
536.52	536.48	-0.04	0.18
684.50	684.53	0.03	0.18
879.41	879.37	-0.04	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (\pm A)
235	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
257	0.0000	0.0000	0.0000	0.0075
	0.8671	0.8625	-0.0046	0.0075
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6443	0.6406	-0.0037	0.0075

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.

Certificate of Calibration

Certificate No. BSCC-UV-170/21

Number of Page(s) 3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ($\pm A$)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5808	0.5807	-0.0001	0.0042
	0.7651	0.7652	0.0001	0.0042
	1.0226	1.0235	0.0009	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5644	0.5645	0.0001	0.0042
	0.7473	0.7476	0.0003	0.0042
	1.0001	1.0009	0.0008	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5216	0.5215	-0.0001	0.0042
	0.6980	0.6970	-0.0010	0.0042
	0.9961	0.9955	-0.0006	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5621	0.5617	-0.0004	0.0042
	0.6932	0.6920	-0.0012	0.0042
	1.0877	1.0867	-0.0010	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)		
	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.91 \pm 0.11nm	200.90	0.9822	2.0078

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

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

End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.



Certificate of Calibration

Equipment:	SPECTROPHOTOMETER	Certificate No.:	C06210259
Model:	DR6000	Issued Date:	10 June 2021
Serial No. (or ID.):	1693421 (EQL-197)	Job No.:	KSPR2107545
Manufacturer:	HACH	Page:	1 of 3
Condition:	In Condition		

Customer: TEST TECH CO., LTD.
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkhuntien Bangkok 10150 Thailand

Environment Condition: Temperature 25.6 °C ± 0.3 °C
Humidity 53.3 %RH ± 2.1 %RH

Calibration Place: TEST TECH CO., LTD. (แผนกน้ำดี)
30,32 Rama II Soi 63, Rama II Rd.,
Samaedam, Bangkhuntien Bangkok 10150 Thailand

Calibration By: Mr. Atachai Ngamchanat
Calibration Date: 10 June 2021
The Method used: In house method, SPCC-WI-24, base on ASTM E 275-08 and ASTM E 387-04

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

The standard for Wavelength Certificate No. 85283 and 85282

The standard for Photometric Certificate No. 107642 and 85755

The standard for Stray light Certificate No. 85760 and 85761

The standard for Spectral resolution Certificate No. 85762




(Mr. Atachai Ngamchanat)

Person in charge



บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.



(Mr. Dumrong Boonsopon)
Authorized signatory

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

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

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

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.9	-0.29	0.13
536.66	536.9	-0.24	0.13
637.98	637.9	0.08	0.13
748.48	748.7	-0.22	0.13
807.03	807.4	-0.37	0.13

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.2878	0.288	-0.0002	0.0045
	0.5157	0.517	-0.0013	0.0045
	1.0258	1.028	-0.0022	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.2816	0.282	-0.0004	0.0045
	0.5059	0.507	-0.0011	0.0045
	1.0044	1.005	-0.0006	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.2467	0.248	-0.0013	0.0045
	0.4579	0.459	-0.0011	0.0045
	0.9301	0.931	-0.0009	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.2419	0.243	-0.0011	0.0045
	0.4646	0.465	-0.0004	0.0045
	0.9453	0.944	0.0013	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.2560	0.257	-0.0010	0.0045
	0.5036	0.503	0.0006	0.0045
	1.0022	1.001	0.0012	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.2553	0.256	-0.0007	0.0045
	0.4971	0.496	0.0011	0.0045
	0.9717	0.969	0.0027	0.0045

Calibration Results:

Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7342	0.736	-0.0018	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8569	0.857	-0.0001	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2859	0.288	-0.0021	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6379	0.636	0.0019	0.0080

Stray light *

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.73 +/- 0.11 nm	260.7	0.9	2.046
391.96 +/- 0.11 nm	392.0	1.1	1.959

The stray light transmission reference is less than 1.0 T(%) and absorbance is greater than 2.0 (A)

Spectral Resolution *

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.77	266.84	1.37	2.00
UUC: Wavelength (nm)	268.7	266.7		
Std Absorbance (A)	0.4200	0.2484		
Absorbance (A)	0.380	0.278		

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

The End of Certificate

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ใบรับรองการทวนสอบ “เครื่องกลั่นไนโตรเจน”

(Calibration Certificate of Distillation Unit VAPODEST

VAP20, VAP30s)

Preventive Maintenance

วันที่ 22 เมษายน 2565 (ครั้งที่ 1/1)

บริษัท เทสท์ เทค จำกัด

ชนิดเครื่องมือ : Distillation Unit

รุ่น : VAPODEST 30

หมายเลขเครื่อง : GER003718

ผลิตภัณฑ์ : Gerhardt



บริษัท เอสพีซี อาร์ที จำกัด

ฝ่ายบริการหลังการขาย

โทร 0-2185-4333 ต่อ 3004-3008 Fax 0-2333-1236, 0-2332-9158 E-mail: service.spc@spc-rt.com

ฝ่ายขายและการตลาด

โทร 0-2185-4333 ต่อ 2133-2134 Fax 0-2331-8809, 0-2332-6216 E-mail : marketing.spc@spc-rt.com

Website: www.spc-rt.com

เงื่อนไขการให้บริการ Preventive Maintenance

บริษัทฯ จะส่งวิศวกรผู้ชำนาญ เพื่อให้บริการตามขอบข่ายของการบริการ เฉพาะ ในวันและเวลา ราชการ หากมีความประสงค์ที่จะรับบริการนอกเหนือจากวัน เวลา ราชการ (วันหยุดเสาร์ – อาทิตย์ หรือวันหยุด นักช้ตฤกษ์) บริษัทฯ จะคิดค่าบริการเพิ่มเติมตามอัตราที่กฎหมายแรงงานกำหนดไว้

ขอบข่ายการบริการ

- ตรวจสอบสภาพการทำงานต่าง ๆ ของเครื่องมือ
- ทดสอบประสิทธิภาพการทำงานของเครื่องมือ
- รายการผลการตรวจสอบเครื่องมือ

หมายเหตุ

- ราคานี้ไม่รวมถึงค่าบริการซ่อม หรือ เปลี่ยนอะไหล่ที่ชำรุดเสียหาย หรือหมดสภาพการใช้งาน
- ในกรณีที่ผู้รับบริการอยู่นอกเขตพื้นที่ให้บริการ บริษัทฯ จำเป็นต้องคิดค่าใช้จ่ายเพิ่มเติม ได้แก่ ค่าเดินทาง เป็นต้น
- บริษัท ฯ ขอสงวนสิทธิ์ในการเปลี่ยนแปลงราคา โดยไม่แจ้งให้ทราบล่วงหน้า

ช่องทางการติดต่อ

บริการหลังการขาย



ทีมงานบริการหลังการขายที่มีความชำนาญ ถูกคำจึงมั่นใจได้ในบริการที่มีประสิทธิภาพจากเรา

โทรศัพท์ : 02-185-4333 งานซ่อม เบอร์ต่อ 3004-3008 , งานติดตั้ง เบอร์ต่อ 3002-3003, 3109

โทรสาร : 02-333-1236, 02-332-9158

E-mail : service.spc@spc-rt.com

บริการลูกค้าสัมพันธ์



สอบถามข้อมูลเพิ่มเติมด้านผลิตภัณฑ์ และ บริการ

โทรศัพท์ : 02-185-4333 ต่อ 2133-2134

โทรสาร : 02-2331-8809, 02-332-6216

E-mail: marketing.spc@spc-rt.com

บริการรับเรื่องร้องเรียน (CSI-Center)



ลูกค้าสามารถร้องเรียน แนะนำ ตี-ชม เกี่ยวกับผลิตภัณฑ์ การบริการ หรือเรื่องอื่นใด ของบริษัทฯ

โทรศัพท์ : 02-185-4333 ต่อ 2150, 6001

E-mail: csl.spc@spc-rt.com

สอบเทียบเครื่องมือ



สอบถามข้อมูลเกี่ยวกับบริการสอบเทียบ

โทรศัพท์ : 02-185-4333 ต่อ 3301-3305

โทรสาร : 02-185 - 4424

E-mail: info.spcc@spc-rt.com

ข้อมูลพื้นฐานของเครื่อง

ผลิตภัณฑ์ : เครื่องกลั่นไนโตรเจน

ชื่อ : GERHARDT

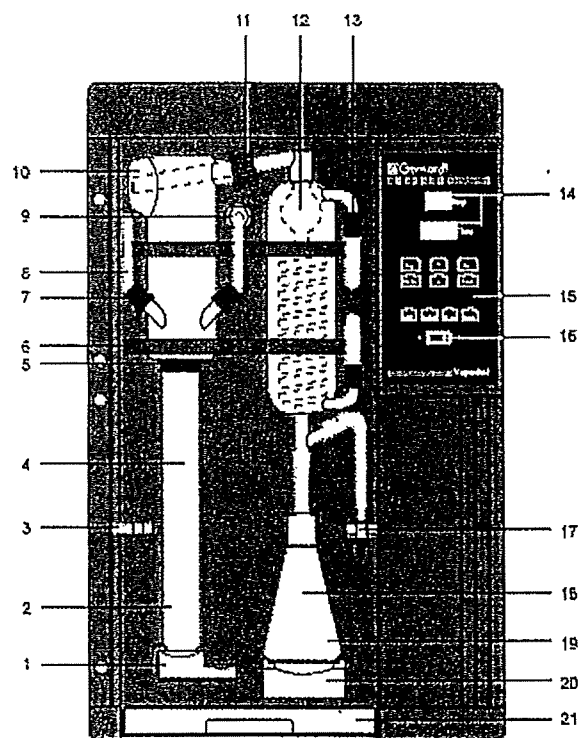
รุ่น : VAPODEST 30

หมายเลขเครื่อง : GER003718

Operational Qualification (OQ)

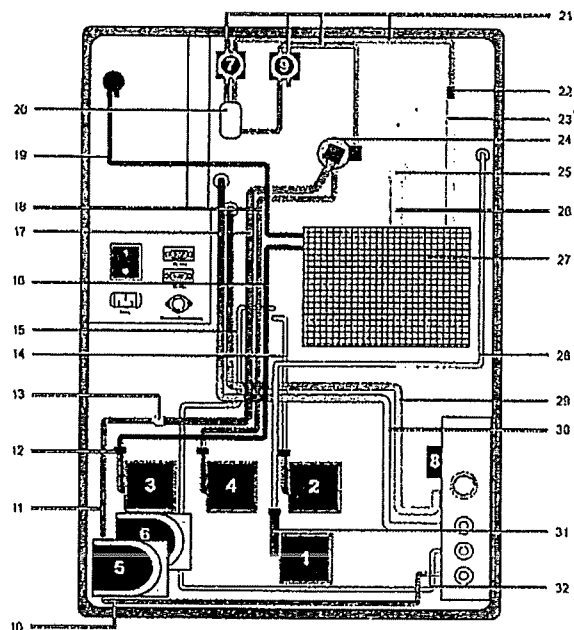
ตรวจสอบสภาพเครื่อง

FRONT



	PASS	FAIL	N/A	REMARK
1. Quick clamping device with wedge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Kjeldatherm digestion tube	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Holder for steam inlet tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. PTFP-Inlet tubing, steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Viton-cone	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Clamping for glassware	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. Screw cap GL18 with silicone seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. PTFP-Inlet tubing, NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. PP-Distributor with PP-threaded joint	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. Distribution head, glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Screw cap GL32 with silicone seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12. Distillation condenser	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13. Screw cap GL14 with plastic screw connection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14. Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15. Keyboard, chemical-resistant	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16. Main switch, green	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17. Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18. Distillate outlet tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19. Erlenmeyer flask	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20. Platform	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
21. Drip tray	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

REAR



	PASS	FAIL	N/A	REMARK
1. Diaphragm pump NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Diaphragm pump H ₃ BO ₃	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Vap 40 only
3. Diaphragm pump H ₂ O for steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Diaphragm pump H ₂ O for sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Vap 30,40 only
5. Peristaltic pump for suction sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Peristaltic pump for suction receiver	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Option
7. Pinch-solenoid valve, steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Magnetic valve with pressure control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. Pinch-solenoid valve, shut-off	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. Verprene-tubing 4x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Verprene-tubing 4x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Vap 30,40 only
12. Non-return valve for diaphragm pumps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13. Tubing reduction PP 51x10x5 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Vap 30,40 only
14. Silicone tubing 4x7 mm.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Vap 40 only
15. Silicone tubing 4x7 mm.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Option
16. Silicone -tubing 4x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17. Verprene-tubing 8x12 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Vap 30,40 only
18. Verprene tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Vap 30,40 only
19. Silicone tubing 4x7 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
20. Ventilation glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
21. Novoprene-tubing 4.8x8 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

	PASS	FAIL	N/A	REMARK
22. Tubing reduction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
23. Silicone tubing 6x10 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
24. PP-distributor with PP-thread	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
25. SKT-valve (built in with brass fitting)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
26. Silicone tubing 8x16x80 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
27. Steam generator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
28. PTFE-inlet tubing NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
29. Silicone tubing 8x16 for cooling water inlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
30. Silicone tubing 8x16 for cooling water outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
31. Viton-tubing 6x12*50 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
32. Silicone tubing 4x7 mm.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

รายละเอียดการตรวจสอบ

ขั้นตอนการบริการ

ตรวจสอบระบบไฟฟ้า (Electrical Test)

- ความต้านทานทางไฟฟ้าของเครื่องกับกราวด์
- กระแสไฟฟ้าที่ใช้งาน

ตรวจสอบสภาพเครื่อง (Optical Test)

- Main cable
- Electric wiring
- Pumps
- Distribution Head
- Condensor
- Steam generator
- Tubing
- Viton cone

ตรวจสอบ Function การทำงาน (The Function Test)

- ระบบสร้างและควบคุมความดันของ Steam
- ระบบการเติมน้ำเข้า Sample Tube
- ระบบการเติม Na OH
- ระบบการ Suction ตั้ง Sample Tube และ Receiver

รายงานผลการให้บริการ

	PASS	FAIL	N/A	REMARK
I. TECHNICAL DATA				
Main Supply 220 volt + 10% 50 Hz with ground	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Normal current	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
I.1 COOLING WATER BATH				
Temperature 15-20 °C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cooling Water Outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Control Temperature	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
I.2 OPTICAL TEST VAP.40				
Screw cap GL14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Screw cap GL18	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Screw cap GL32	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Distillation Condensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Viton Cone	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Ventilation Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Micro Switch Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. SYSTEM COOLING WATER INLET				
Cooling Water Inlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cooling Water Outlet	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Magnetic valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. SYSTEM CONTROL				
Key Board	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Adding H ₂ O	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Vap 30,40 only
Adding NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Adding H ₃ BO ₃	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Vap 40 only
Suction Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. SYSTEM DISTILLATION				
Boiler	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Level Sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Neoprene-Tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Solenoid Valve Shut-Off	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Solenoid Valve Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Excess Pressure Detector	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

int

	PASS	FAIL	N/A	REMARK
5. PUMP				
Pump H ₂ O Steam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
- Non-Return Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pump H ₂ O Sample	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
- Non-Return Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pump NaOH	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
- Non-Return Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pump suction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
- Non-Return Valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. The Following Program Run :				
Addition H ₂ O 0-99 sec.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Addition NaOH 0-99 sec.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Addition H ₃ BO ₃ 0-99 sec.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Reaction Time 0-99 min	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Distillation Time 0-99	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Steam Capacity 30%-100%	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Suction Time 0-99 sec.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
The Instrument is in perfect technical shape	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Remark : _____

Engineer : นายณพดล สุขวานิตย์

ข้อมูลสนับสนุนด้านเทคนิค (General Technical Support)

การบำรุงรักษาทั่วไป (Basic maintenance)

Cleaning

Glass parts and suction pump should be cleaned before long periods of non-usage (i.e. holidays). This way blockages caused by crystalline deposits are avoided.

The following program should be run:

Addition H_3BO_3	0	s
Addition H_2O :	13	s
Addition NaOH:	0	s
Reaction time:	0	s
Distillation time:	7	min.
Steam capacity:	100	%
Suction time:	20	s

Place an empty digestion tube and an Erlenmeyer flask into position, and start the program.

In case of extreme deposits in the glassware you can clean the system by putting about 10 ml of sulphuric acid into the digestion tube.

Error Code


The micro-processor continually surveys all the functions of the distillation system. As soon as an error arises it is shown on the display and accompanied by an acoustic signal.

Error message	Measures
No tap water	Check cooling water inlet for blockages. Ensure the tap is turned on
No sample tube	Insert tube
Check chemicals	Check set of tanks
Low water Press Enter	Check the water inlet distilled H_2O
↓ Filling Steam generator	This message disappears as soon as steam generator is filled

After the above mentioned errors are corrected, the following message is displayed.

Error message	Measures
Stop Prog.No. x continue=Enter	Enter = continue of interrupted program Reset = Standby-mode

Other error messages

Error message	Measures
Wait for steam	Message disappears as soon as stand-by is reached
Add sol. > 1min Continue=Enter	Check programming Enter=continue of interrupted program Reset=Standby-mode
Program undefined	Check programming → 
Excess steam pressure	Switch the system off and call service
Sensor error	Switch the system off and call service