

ภาคผนวก ง

สำเนาใบรับรองการสอบเทียบเครื่องมือ

Mettler-Toledo (Thailand) Ltd.

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Bangna District, Bangkok 10260

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MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: SGS (THAILAND) CO.,LTD.
Address: 1/209,1/211 Moo 1, Ban Chang
City: Ban Chang **Contact:** Hatairat Linjee
Zip / Postal: 21130
State / Province: Rayong
Order Number: 
0 3 3 2 7 1 0 0 6 1

Weighing Device

Manufacturer: Mettler Toledo **Instrument Type:** Weighing Instrument
Model: XS205DU **Asset Number:** N/A
Serial No.: B036065880 **Terminal Model:** SAT
Building: LABORATORY **Terminal Serial No.:** B036065880
Floor: 1 **Terminal Asset No.:** N/A
Room: BalanceLab

Range	Max. Capacity	Readability (d)
1	81 g	0.00001 g
2	220 g	0.0001 g

Procedure



Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

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.

	Temperature		Humidity	
As Found	Start: 20.1 °C	End: 19.9 °C	Start: 71.6 %	End: 60.2 %

As Found Calibration Date: 14-Mar-2023 **Calibrator:** 
As Left Calibration Date: N/A
Issue Date: 15-Mar-2023
Approved Signatory: 
Technical Manager / Head of Calibration Center

Measurement Results

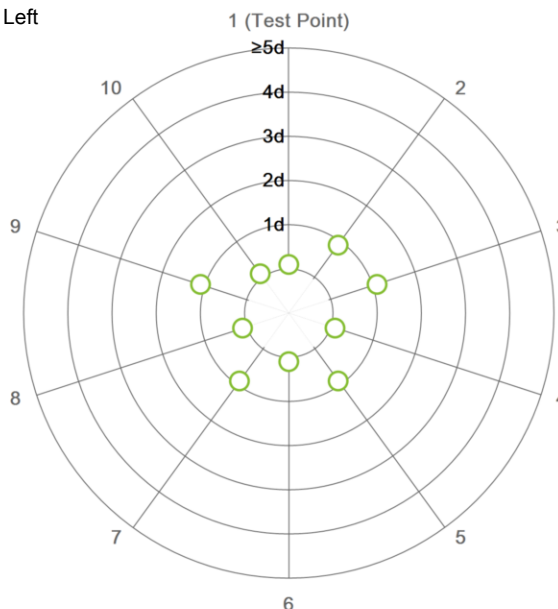
Repeatability

Test Load: 70 g

	As Found	As Left
1	70.00005 g	N/A
2	70.00004 g	N/A
3	70.00006 g	N/A
4	70.00005 g	N/A
5	70.00004 g	N/A
6	70.00005 g	N/A
7	70.00004 g	N/A
8	70.00005 g	N/A
9	70.00006 g	N/A
10	70.00005 g	N/A

Standard Deviation	0.000007 g	N/A
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○ As Found
◆ As Left



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

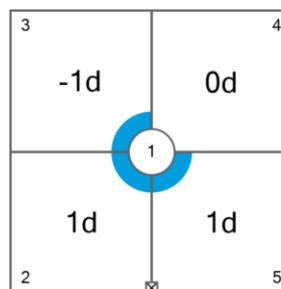
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0001 g	N/A
3	99.9999 g	N/A
4	100.0000 g	N/A
5	100.0001 g	N/A

Maximum Deviation	0.0001 g	N/A
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As Found

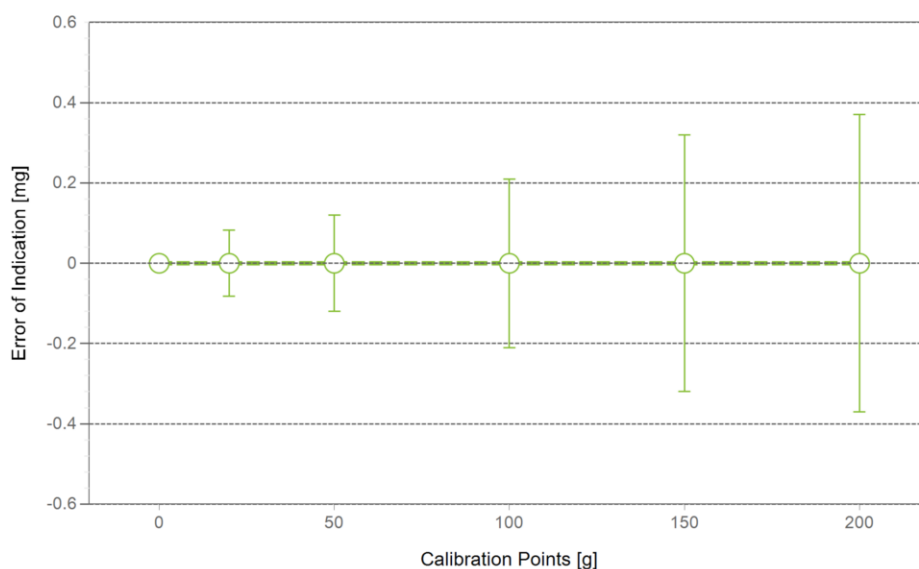
The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.016 mg	2
2	0.01000 g	0.01000 g	0.00000 g	0.018 mg	2
3	0.10000 g	0.10000 g	0.00000 g	0.022 mg	2
4	0.99999 g	0.99998 g	-0.00001 g	0.032 mg	2
5	4.99998 g	4.99997 g	-0.00001 g	0.048 mg	2
6	9.99999 g	10.00000 g	0.00001 g	0.061 mg	2
7	20.00000 g	20.00000 g	0.00000 g	0.082 mg	2
8 ¹	50.00005 g	50.00005 g	0.00000 g	0.12 mg	2
9	100.0001 g	100.0001 g	0.0000 g	0.21 mg	2
10	150.0001 g	150.0001 g	0.0000 g	0.32 mg	2
11	200.0001 g	200.0001 g	0.0000 g	0.37 mg	2

¹The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



○ As Found

◆ As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

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.:	WS28	Date of Issue:	01-Apr-2022
Certificate Number:	178498	Calibration Due Date:	17-Sep-2023

Thermo Hygrometer

Equipment No.:	IN51	Date of Issue:	17-Feb-2023
Certificate Number:	SG-H-00144/66	Calibration Due Date:	15-Feb-2024

Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

End of Accredited Section

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

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: $1.5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

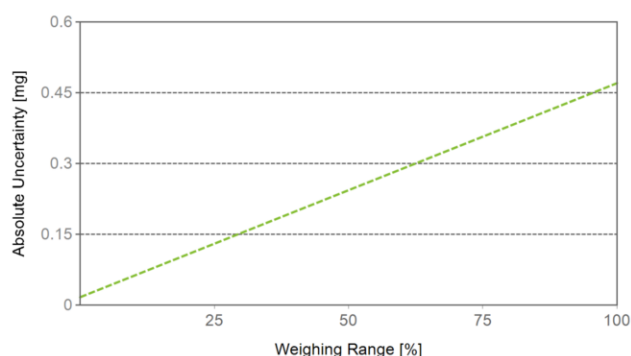
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.00001 g	81 g	$U_1 = 0.017 \text{ mg} + 0.00560 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.00554 \text{ mg/g} \cdot R$	N/A

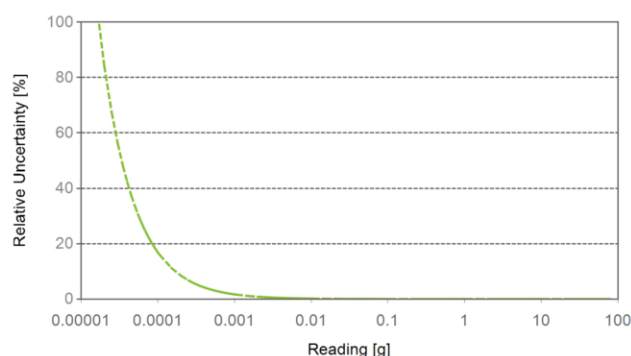
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.00220 g	0.017 mg	0.77%	N/A	N/A
0.02200 g	0.017 mg	0.078%	N/A	N/A
0.22000 g	0.018 mg	0.0083%	N/A	N/A
2.20000 g	0.029 mg	0.0013%	N/A	N/A
220.0000 g	1.3 mg	0.00058%	N/A	N/A



As Found



As Left

The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

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.

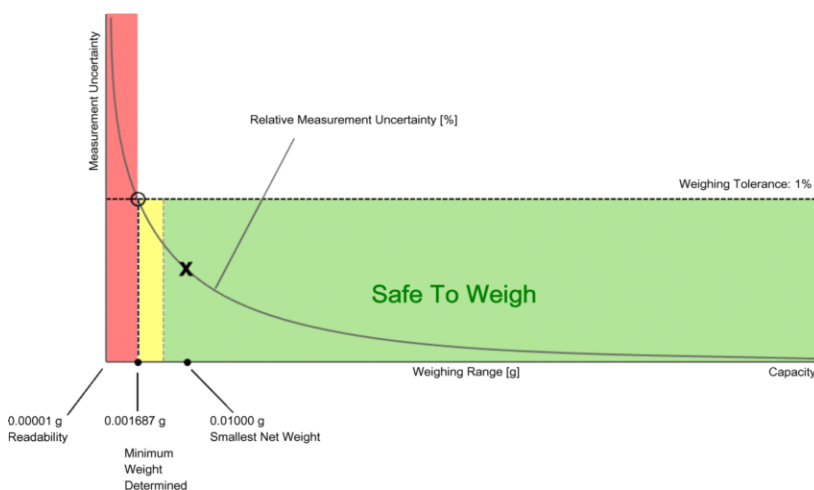
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.01000 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 testing, unless only As Found was performed.

Minimum Weight

As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016961 g	0.034113 g	0.051461 g	0.086758 g	0.178664 g
0.2%	0.008456 g	0.016961 g	0.025513 g	0.042763 g	0.086758 g
0.5%	0.003377 g	0.006761 g	0.010153 g	0.016961 g	0.034113 g
1%	0.001687 g	0.003377 g	0.005068 g	0.008456 g	0.016961 g
2%	0.000844 g	0.001687 g	0.002532 g	0.004222 g	0.008456 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001687 g	0.003377 g

The minimum weight table applies to the fine range of the weighing device.



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

As Left Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016961 g	0.034113 g	0.051461 g	0.086758 g	0.178664 g
0.2%	0.008456 g	0.016961 g	0.025513 g	0.042763 g	0.086758 g
0.5%	0.003377 g	0.006761 g	0.010153 g	0.016961 g	0.034113 g
1%	0.001687 g	0.003377 g	0.005068 g	0.008456 g	0.016961 g
2%	0.000844 g	0.001687 g	0.002532 g	0.004222 g	0.008456 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001687 g	0.003377 g

The minimum weight table applies to the fine range of the weighing device.



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 past, 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

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 70 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	0.000005 g	0.000007 g	✗	0.000007 g	✗
0.2%	0.000010 g		✓		⚠
0.5%	0.000025 g		✓		✓
1%	0.000050 g		✓		✓
2%	0.000100 g		✓		✓
5%	0.000250 g		✓		✓

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		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0001 g	✓	0.0001 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 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**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.00000 g	0.00000 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
50.00005 g	0.00000 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0001 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0001 g	0.0000 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0000 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.00000 g	0.00000 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
50.00005 g	0.00000 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0001 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0001 g	0.0000 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0000 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 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.



Certificate of Calibration

Calibration Certification Information

Cal. Date: November 28, 2022 Rootsmeter S/N: 438320 Ta: 294 °K
Operator: Jim Tisch Pa: 748.8 mm Hg
Calibration Model #: TE-5025A Calibrator S/N: 1290

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3960	3.2	2.00
2	3	4	1	0.9800	6.4	4.00
3	5	6	1	0.8770	8.0	5.00
4	7	8	1	0.8370	8.8	5.50
5	9	10	1	0.6930	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)
0.9944	0.7123	1.4133	0.9957	0.7133	0.8862
0.9901	1.0103	1.9987	0.9915	1.0117	1.2532
0.9880	1.1266	2.2346	0.9893	1.1281	1.4011
0.9869	1.1791	2.3436	0.9882	1.1807	1.4695
0.9816	1.4164	2.8265	0.9829	1.4183	1.7723
QSTD	m=	2.00726	QA	m=	1.25691
	b=	-0.02247		b=	-0.01409
	r=	0.99994		r=	0.99994

Calculations

Vstd=	$\Delta Vol / ((Pa - \Delta P) / Pstd) (Tstd / Ta)$	Va=	$\Delta Vol / ((Pa - \Delta P) / Pa)$
Qstd=	Vstd / ΔTime	Qa=	Va / ΔTime
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



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

วันที่ : 24 กุมภาพันธ์ 2566

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T300

หมายเลขอุปกรณ์ / เครื่องมือ : 5881

TEST VALUES

API MODEL T300			BEFORE	AFTER
1	RANGE	1 - 1000 PPM	50.0	50.0
2	STABILITY	≤ 1 PPM	0.01	0.01
3	CO MEASURE	2500 - 4800 mV	3909.3	4017.3
4	CO REFERENCE	2000 - 4800 mV	3376.8	3472.5
5	MR RATIO	1.1 - 1.3	1.161	1.2
6	PRESEEURE	25 - 35 in - Hg-A	28.8	29.0
7	SAMPLE FLOW	800 \pm 10% cc/min	848	828
8	SAMPLE TEMP	48 \pm 4 $^{\circ}$ C	48.4	46.7
9	BENCH TEMP	48 \pm 2 $^{\circ}$ C	48.0	48.0
10	WHEEL TEMP	68 \pm 2 $^{\circ}$ C	68.0	67.9
11	BOX TEMP	AMBIENT \pm 5 $^{\circ}$ C	33.4	38.3
12	PHT DRIVE	250 - 4750 mV	2541.7	2360.6
13	CO SLOPE	1.0 \pm 0.3	1.056	1.020
14	CO OFFSET	0.0 \pm 0.3	-0.049	-0.049
15	CO READING (AMBIENT)	PPM	0.283	0.021
16	ELECTRICAL TEST	40 \pm 2 PPM	40.0	40.3
17	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.18 /12.16 /16.29 /-15.20	5.18 /12.16 /16.29 /-15.20
18	ZERO GAS	0.00 PPM	0.103	0.034
19	SPAN GAS	40.0 PPM	42.590	40.143

หมายเหตุ

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

VERIFIED

DATE Mar 07, 2023

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาติวนารักษ์

โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 5881

STANDARD GAS CONCENTRATION (PPM) : 4512

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1550

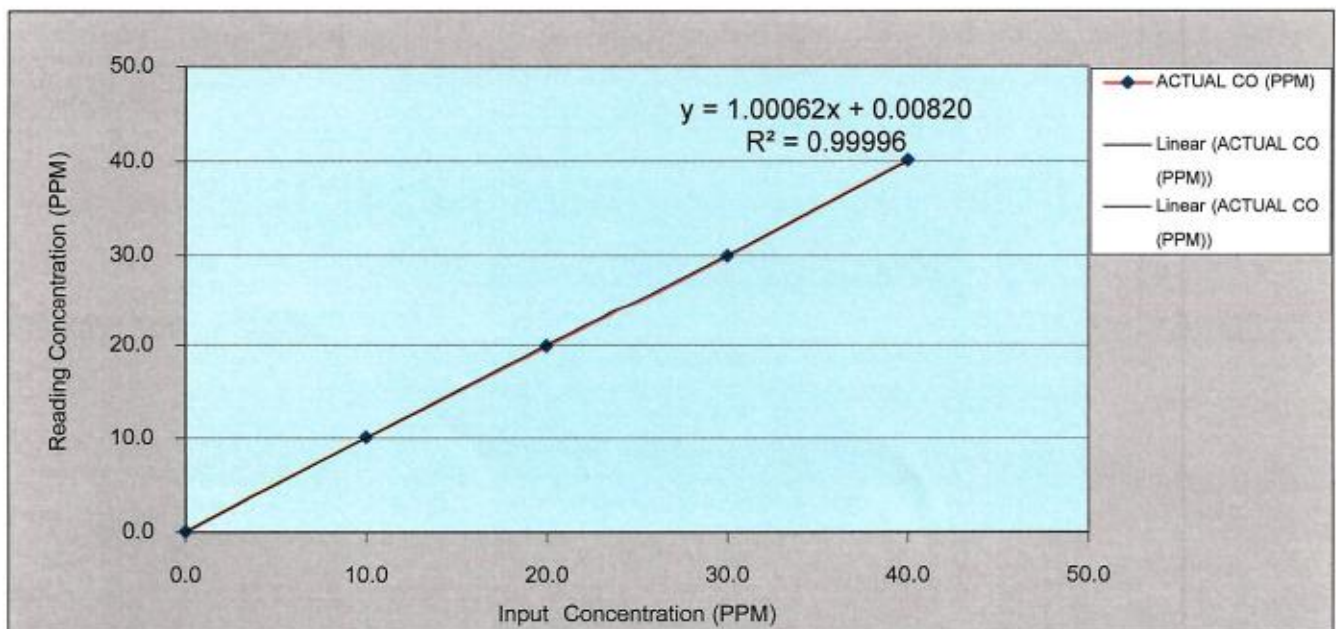
CERTIFIED DATE : Mar 10 ,2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10 ,2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.034	0.034	0.00
1	10.00	10.077	0.077	0.770
2	20.00	19.928	-0.072	-0.360
3	30.00	29.921	-0.079	-0.263
4	40.00	40.143	0.143	0.358
AVERAGE (%)				0.505



CALIBRATED BY :

DATE : 24 /02 /2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม :

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622 Reference Number: 160-402045691-1
Cylinder Number: CC745169 Cylinder Volume: 144.4 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T300

วันที่ : 7 กุมภาพันธ์ 2565

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 5881

TEST VALUES			
API MODEL T300		BEFORE	AFTER
1	RANGE 1 - 1000 PPM	50	50
2	STABILITY ≤ 1 PPM	0.15	0.21
3	CO MEASURE 2500 - 4800 mV	4489.4	4501.1
4	CO REFERENCE 2000 - 4800 mV	3873.5	3885.3
5	PRESEURE 25 - 35 in - Hg-A	29.0	28.9
6	SAMPLE FLOW $800 \pm 10\%$ cc/min	837	835
7	SAMPLE TEMP $48 \pm 4^{\circ}\text{C}$	46.6	46.5
8	BENCH TEMP $48 \pm 2^{\circ}\text{C}$	48	48
9	WHEEL TEMP $68 \pm 2^{\circ}\text{C}$	68.3	67.9
10	BOX TEMP AMBIENT $\pm 5^{\circ}\text{C}$	38.8	37.3
11	SLOPE 1.0 ± 0.3	1.065	1.069
12	OFFSET 0.0 ± 0.3	-0.045	0.436
13	CO READING (AMBIENT) PPM	1.339	0.115
14	VOLTAGE TEST +5 V +12 V +15 V -15 V	-	-
15	ZERO GAS 0.00 PPM	0.750	0.001
16	SPAN GAS 40.0 PPM	41.574	40.029

หมายเหตุ



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด



ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาติวนารักษ์

โทรศัพท์ : 0-2515-8987

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



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T300

วันที่ : 20 กรกฎาคม 2566

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 2550

TEST VALUES

API MODEL T300				BEFORE	AFTER
1	RANGE	1 - 1000 PPM		50.0	50.0
2	STABILITY	≤ 1 PPM		0.00	0.00
3	CO MEASURE	2500 - 4800 mV		3471.0	3494.4
4	CO REFERENCE	2000 - 4800 mV		2904.2	2931.0
5	MR RATIO	1.1 - 1.3		-	-
6	PRESSURE	25 - 35 in - Hg-A		29.4	29.6
7	SAMPLE FLOW	800 ± 10% cc/min		783.9	786.3
8	SAMPLE TEMP	48 ± 4 °C		44.8	44.7
9	BENCH TEMP	48 ± 2 °C		48.0	48.0
10	WHEEL TEMP	68 ± 2 °C		68.0	68.0
11	BOX TEMP	AMBIENT ± 5 °C		36.0	36.4
12	PHT DRIVE	250 - 4750 mV		-	-
13	CO SLOPE	1.0 ± 0.3		0.958	0.938
14	CO OFFSET	0.0 ± 0.3		-0.008	-0.007
15	CO READING (AMBIENT)	PPM		0.21	0.30
16	ELECTRICAL TEST	40 ± 2 PPM		-	-
17	VOLTAGE TEST	+5 V +12 V +15 V -15 V		5.23 / 12.23 / 16.58 / -15.17	5.23 / 12.23 / 16.58 / -15.17
18	ZERO GAS	0.00 PPM		-0.07	0.02
19	SPAN GAS	40.0 PPM		42.55	40.01

หมายเหตุ

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

ลงนามเจ้าหน้าที่ (Signature)

VERIFIED

DATE Aug 07, 2023

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 2550

STANDARD GAS CONCENTRATION (PPM) : 4512

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1420

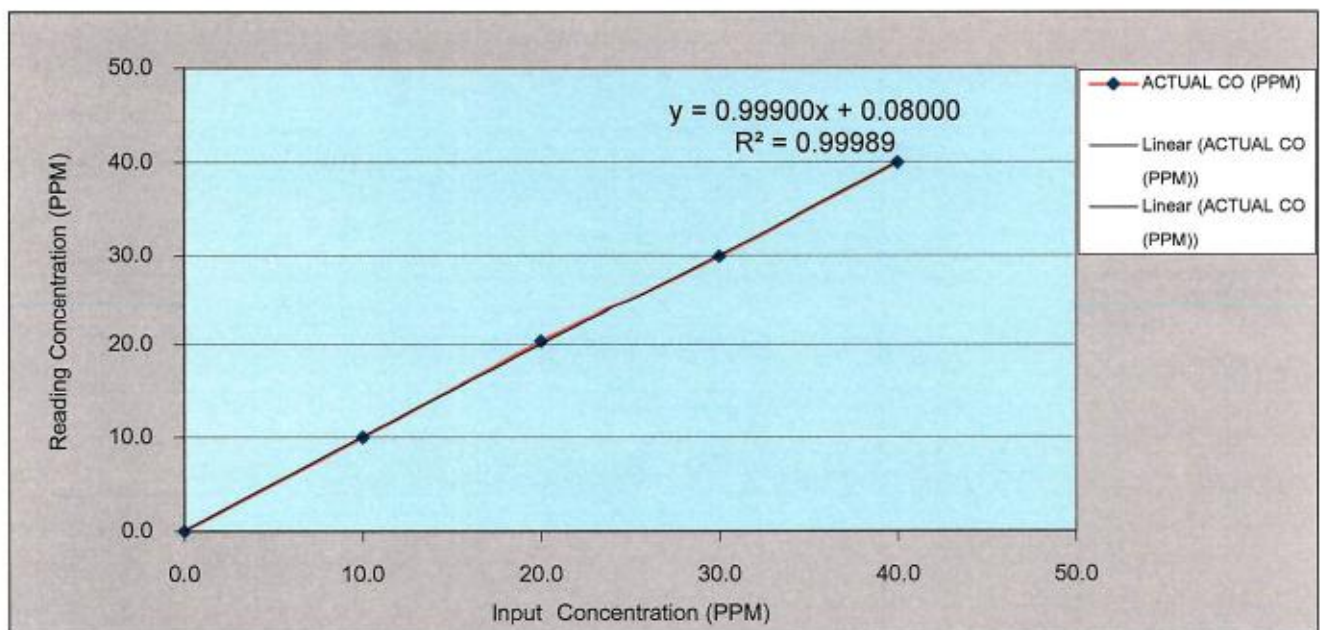
CERTIFIED DATE : Mar 10 ,2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10 ,2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.02	0.02	0.00
1	10.00	10.00	0.00	0.00
2	20.00	20.35	0.35	1.75
3	30.00	29.92	-0.08	-0.27
4	40.00	40.01	0.01	0.02
AVERAGE (%)				0.51



CALIBRATED BY : คุณพรชัย ผาติวนารักษ์

DATE : 20 กรกฎาคม 2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณพรชัย ผาติวนารักษ์ โทรศัพท์ : 02-515-8987

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/03/2021, 03/10/2021
NITROGEN	Balance				03/04/2021

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg

Net Weight: 4.6 Kg



รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

วันที่ : 20 กรกฎาคม 2566

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T300

หมายเลขอุปกรณ์ / เครื่องมือ : 1885

TEST VALUES			
API MODEL T300			
		BEFORE	AFTER
1	RANGE	1 - 1000 PPM	50.0
2	STABILITY	≤ 1 PPM	0.009
3	CO MEASURE	2500 - 4800 mV	3877.5
4	CO REFERENCE	2000 - 4800 mV	3163.2
5	MR RATIO	1.1 - 1.3	1.233
6	PRESSURE	25 - 35 in - Hg-A	29.2
7	SAMPLE FLOW	800 ± 10% cc/min	808
8	SAMPLE TEMP	48 ± 4 °C	45.5
9	BENCH TEMP	48 ± 2 °C	48.0
10	WHEEL TEMP	68 ± 2 °C	68.0
11	BOX TEMP	AMBIENT ± 5 °C	32.2
12	PHT DRIVE	250 - 4750 mV	3316.2
13	CO SLOPE	1.0 ± 0.3	0.892
14	CO OFFSET	0.0 ± 0.3	0.024
15	CO READING (AMBIENT)	PPM	0.852
16	ELECTRICAL TEST	40 ± 2 PPM	1100.000
17	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.20 / 12.24 / 16.71 / -15.32
18	ZERO GAS	0.00 PPM	0.480
19	SPAN GAS	40.0 PPM	43.073

หมายเหตุ

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

ลงนามเจ้าหน้าที่ (Signature)

VERIFIED

DATE Aug 07, 2023

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ

โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 1885

STANDARD GAS CONCENTRATION (PPM) : 4512

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1420

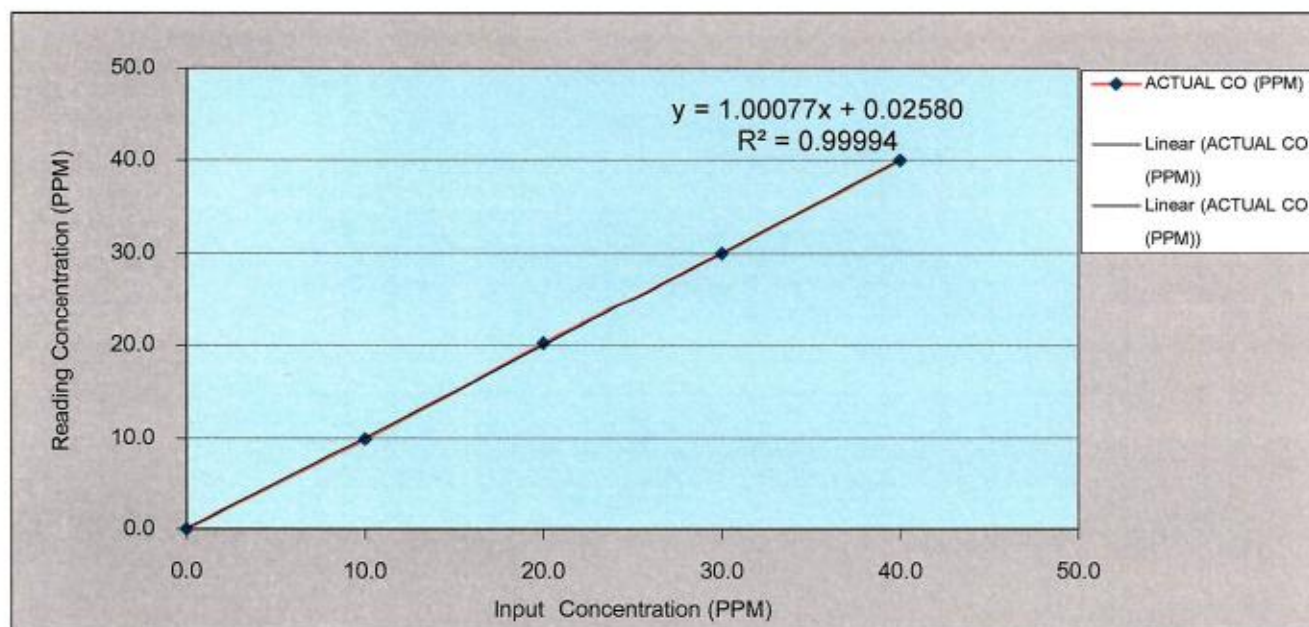
CERTIFIED DATE : Mar 10 ,2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10 ,2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.002	0.002	0.00
1	10.00	9.939	-0.061	-0.610
2	20.00	20.251	0.251	1.255
3	30.00	30.008	0.008	0.027
4	40.00	40.006	0.006	0.015
AVERAGE (%)				0.476



CALIBRATED BY :

DATE : 20 กรกฎาคม 2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม :

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/03/2021, 03/10/2021
NITROGEN	Balance				03/04/2021

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T200

วันที่ : 24 กรกฎาคม 2566

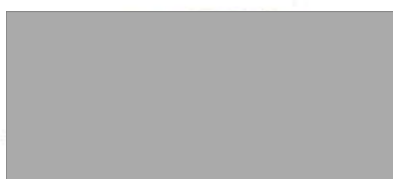
บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 1652

TEST VALUES			
API MODEL T200			
		BEFORE	AFTER
1	RANGE 50 - 20,000 PPB	500.0	500.0
2	STABILITY ≤ 1 PPB	0.1	0.2
3	SAMPLE FLOW 500 ± 10% cc/min	XXX	491
4	OZONE FLOW 80 ± 10% cc/min	XXX	80
5	PMT mV	130.6	44.7
6	NORM PMT mV	31.0	0.3
7	A ZERO -20 To 150 MV	137.4	47.4
8	HPVS 400 - 900 V	749	723
9	RX CELL TEMP 50 ± 1 °C	50.0	50.0
10	BOX TEMP AMBIENT ± 5 °C	28.3	29.3
11	PMT TEMP 7 ± 2 °C	6.8	6.9
12	MOLY TEMP 315 ± 5 °C	315.4	314.6
13	RX CELL PRESSURE <10 in - Hg-A	-3.0	9.2
14	SAMPLE PRESSURE 25 - 35 in - Hg-A	29.0	29.2
15	NOX SLOPE 1.0 ± 0.3	1.150	0.984
16	NOX OFFSET -50 To 150	3.0	-3.5
17	NO SLOPE 1.0 ± 0.3	1.080	0.975
18	NO OFFSET -50 To 150	1.8	-3.0
19	NO SAMPLE READING PPB	2.3	0.9
20	NO2 SAMPLE READING PPB	57.7	9.0
21	NOX SAMPLE READING PPB	60.0	9.9
22	OPTIC TEST 2000 ± 1000 mV	2219.6	2005.0
23	ELECTRICAL TEST 2000 ± 1000 mV	2507.9	1834.8
24	VOLTAGE TEST +5 V +12 V +15 V -15 V	5.26 / 12.33 / 15.82 / -15.21	5.26 / 12.33 / 15.82 / -15.21
25	ZERO GAS NO/NO _x 0.00/0.00 PPB	-3.8 / -3.8	0.50 / 0.90
26	SPAN GAS NO/NO _x 400.00/400.00 PPB	450.6 / 474.3	401.4 / 401.6

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 3 ชิ้น, O-ring 6 ชิ้น, Spring 3 ชิ้น
- ตรวจเช็คพบว่า Moly Temp Warning , Relay Board Warning , Ozone Gen และ Sample Flow ไม่สามารถวัดค่าได้ / แก้ไขเรียบร้อยแล้ว
- ทำการเปลี่ยน Pressure Sensor 0-15 PSI จำนวน 1 ชิ้น



ลงนามเจ้าหน้าที่ (Signature)

VERIFIED

DATE *Aug 07, 2023*

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : NO_x Analyzer

MANUFACTURER : Teledyne - API

MODEL : T200

SERIAL NO : 1652

STANDARD GAS CONCENTRATION (PPM) : 53.40

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1420

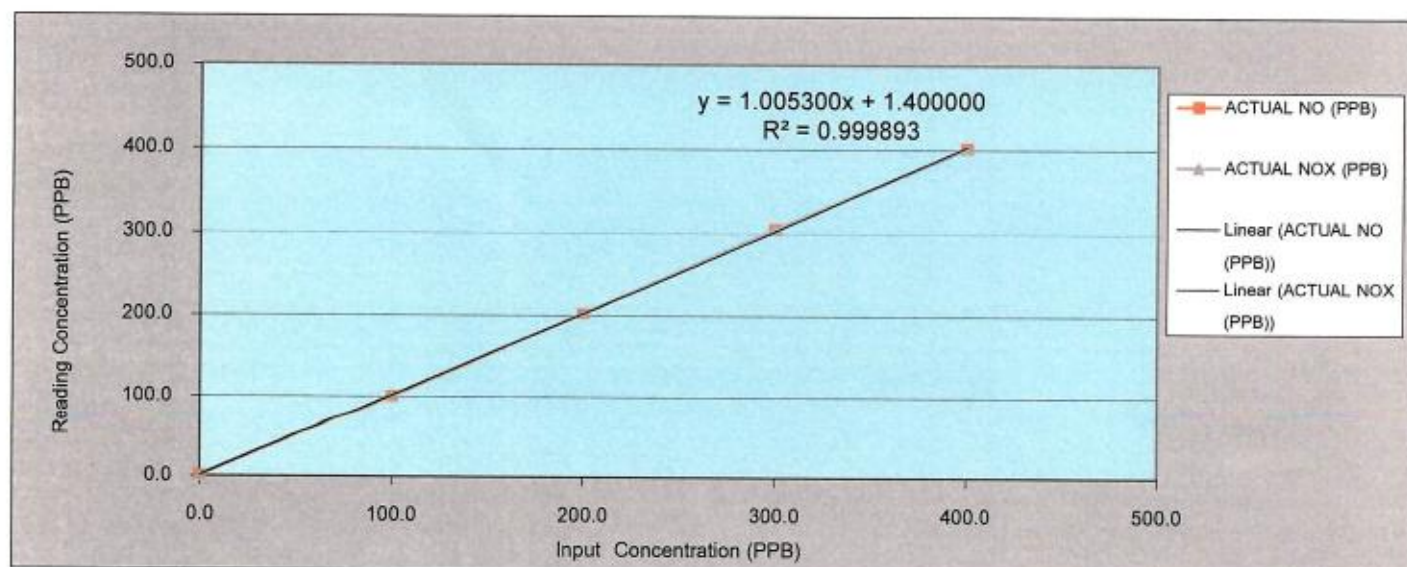
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO _x (PPB)	ERROR NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.5	0.5	-	0.9	0.9	-
1	100.0	101.0	1.0	1.0	101.7	1.7	1.7
2	200.0	202.2	2.2	1.1	202.5	2.5	1.3
3	300.0	305.4	5.4	1.8	305.6	5.6	1.9
4	400.0	401.4	1.4	-0.1	401.6	1.6	0.4
AVERAGE (%)				1.0			1.3



CALIBRATED BY :

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม :

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T200

วันที่ : 29 มิถุนายน 2566

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 2975

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	STABILITY	≤ 1 PPB	0.2
3	SAMPLE FLOW	500 ± 10% cc/min	488
4	OZONE FLOW	80 ± 10% cc/min	78
5	PMT	mV	457.0
6	NORM PMT	mV	510.9
7	A ZERO	-20 To 150 MV	270.7
8	HPVS	400 - 900 V	795
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	34.7
11	PMT TEMP	7 ± 2 °C	7.5
12	MOLY TEMP	315 ± 5 °C	313.9
13	RX CELL PRESSURE	<10 in - Hg-A	9.6
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.3
15	NOX SLOPE	1.0 ± 0.3	1.519
16	NOX OFFSET	-50 To 150	260.5
17	NO SLOPE	1.0 ± 0.3	1.320
18	NO OFFSET	-50 To 150	257.0
19	NO SAMPLE READING	PPB	156.0
20	NO2 SAMPLE READING	PPB	47.1
21	NOX SAMPLE READING	PPB	202.4
22	OPTIC TEST	2000 ± 1000 mV	1880.8
23	ELECTRICAL TEST	2000 ± 1000 mV	2096.0
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.28 / 12.21 / 15.73 / -15.17
25	ZERO GAS NO/NO _x	0.00/0.00 PPB	134.2 / 153.1
26	SPAN GAS NO/NO _x	400.00/400.00 PPB	652.5 / 739.8

หมายเหตุ

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

- ตรวจเช็คพบว่า A ZERO WARNING เนื่องจากหลอด PMTเสื่อมสภาพ ทำการเปลี่ยน หลอด CD PMT 1 หลอด

VERIFIED

DATE Jun 30, 2023

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ

โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : NO_x Analyzer

MANUFACTURER : Teledyne - API

MODEL : T200

SERIAL NO : 2975

STANDARD GAS CONCENTRATION (PPM) : 53.40

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1400

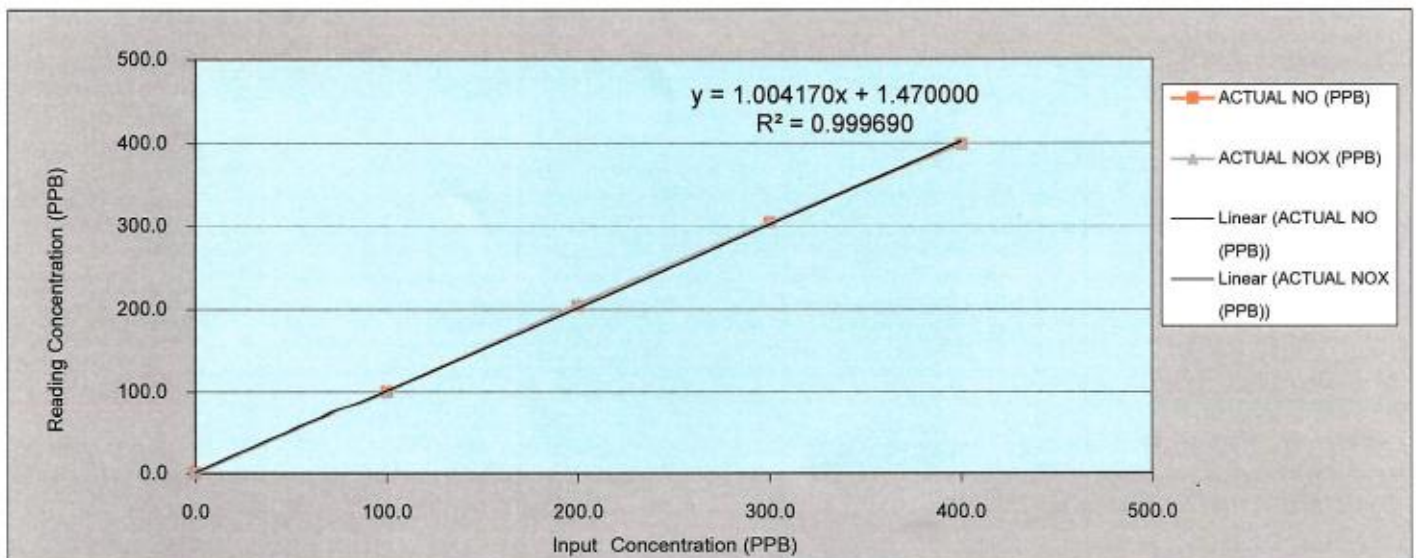
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO _x (PPB)	ERROR NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.1	0.1	-	0.1	0.1	-
1	100.0	100.5	0.5	0.5	100.5	0.5	0.5
2	200.0	204.2	4.2	2.1	206.2	6.2	3.1
3	300.0	304.1	4.1	1.4	304.6	4.6	1.5
4	400.0	399.1	-0.86	-0.1	400.1	0.1	0.0
AVERAGE (%)				1.0			1.3



CALIBRATED BY :

DATE : 29 มิถุนายน 2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม :

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T100

วันที่ : 3 พฤษภาคม 2566

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 1385

TEST VALUES

API MODEL T100			BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0	500.0
2	SO ₂ STABILITY	≤ 1 PPB	0.2	0.3
3	PRESSURE	25 - 35 in - Hg-A	27.4	28.4
4	SAMPLE FLOW	700 ± 10% cc/min	663	667.0
5	PMT	mV	89.1	26.7
6	NORM PMT	mV	90.1	30.2
7	UV LAMP	1000 - 4800 mV	3779.6	3494.5
8	LAMP RATIO	30 To 120 %	101.4	93.8
9	STRAY LIGHT	≤ 100 PPB	24.7	12.5
10	DARK PMT	-50 ± 200 % mV	18.6	35.1
11	DARK LAMP	-50 ± 200 % mV	-3.9	0.7
12	SO ₂ SLOPE	1.0 ± 0.3	1.632	0.926
13	SO ₂ OFFSET	< 250 mV	30.3	20.4
14	HVPS	400 - 900 V	606	615
15	RX CELL TEMP	50 ± 1 °C	50.0	50.0
16	BOX TEMP	AMBIENT ± 5 °C	34.8	34.1
17	PMT TEMP	7 ± 2 °C	8.7	8.7
18	SO ₂ SAMPLE READING	PPB	61.5	0.3
19	OPTIC TEST	2000 ± 1000 mV	1259.1	2154.6
20	ELECTRICAL TEST	2000 ± 1000 mV	1438.1	1926.4
21	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.23/ 12.15 /15.28 /-15.20	5.23/ 12.15 /15.28 /-15.20
22	ZERO GAS	0.00 PPB	24.1	0.1
23	SPAN GAS	400.00 PPB	314.7	401.2

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, Spring 1 ชิ้น, O-ring 2 ชิ้น Sample Filter 47mm. 1 ชิ้น

VERIFIED

DATE May 11, 2023

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME :SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : SO₂ Analyzer

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NUMBER : 1385

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CC745169

CYLINDER PRESSURE (PSIG) : 1450

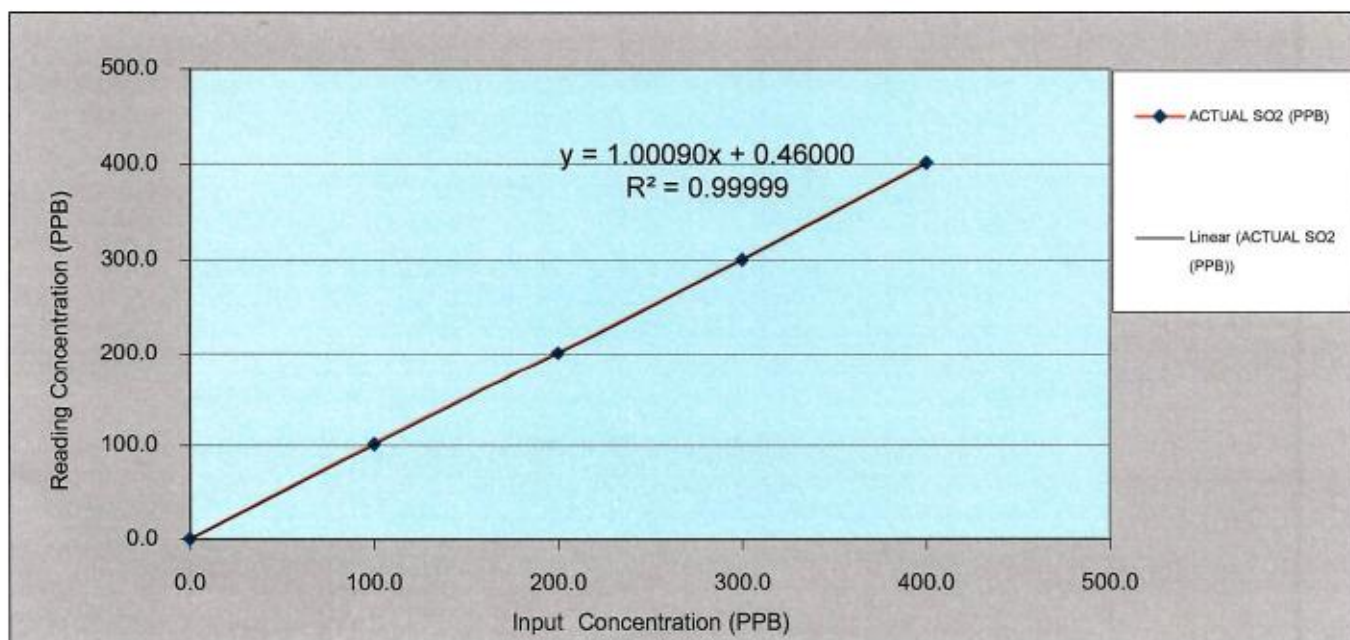
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPB)	ACTUAL SO ₂ (PPB)	ERROR SO ₂ (PPB)	% ERROR SO ₂
ZERO	0.00	0.1	0.09	0.00
1	100.0	101.0	1.00	1.00
2	200.0	201.0	1.00	0.50
3	300.0	300.1	0.10	0.03
4	400.0	401.0	1.00	0.25
AVERAGE (%)				0.00



CALIBRATED BY :

DATE : 03 /05 /2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : ศ

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/03/2021, 03/10/2021
NITROGEN	Balance				03/04/2021

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

วันที่ : 20 กรกฎาคม 2566

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T300

หมายเลขอุปกรณ์ / เครื่องมือ : 1885

TEST VALUES				
API MODEL T300			BEFORE	AFTER
1	RANGE	1 - 1000 PPM	50.0	50.0
2	STABILITY	≤ 1 PPM	0.009	0.012
3	CO MEASURE	2500 - 4800 mV	3677.5	3764.6
4	CO REFERENCE	2000 - 4800 mV	3163.2	3070.8
5	MR RATIO	1.1 - 1.3	1.233	1.234
6	PRESSURE	25 - 35 in - Hg-A	29.2	29.3
7	SAMPLE FLOW	800 ± 10% cc/min	808	820
8	SAMPLE TEMP	48 ± 4 °C	45.5	45.4
9	BENCH TEMP	48 ± 2 °C	48.0	48.0
10	WHEEL TEMP	68 ± 2 °C	68.0	68.0
11	BOX TEMP	AMBIENT ± 5 °C	32.2	35.1
12	PHT DRIVE	250 - 4750 mV	3316.2	3311.0
13	CO SLOPE	1.0 ± 0.3	0.892	0.905
14	CO OFFSET	0.0 ± 0.3	0.024	0.024
15	CO READING (AMBIENT)	PPM	0.852	0.308
16	ELECTRICAL TEST	40 ± 2 PPM	1100.000	40.132
17	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.20 / 12.24 / 16.71 / -15.32	5.20 / 12.24 / 16.71 / -15.32
18	ZERO GAS	0.00 PPM	0.480	0.002
19	SPAN GAS	40.0 PPM	43.073	40.006

หมายเหตุ

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

ลงนามเจ้าหน้าที่ (Signature)

VERIFIED

DATE Aug 07 2013

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ :

โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 1885

STANDARD GAS CONCENTRATION (PPM) : 4512

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1420

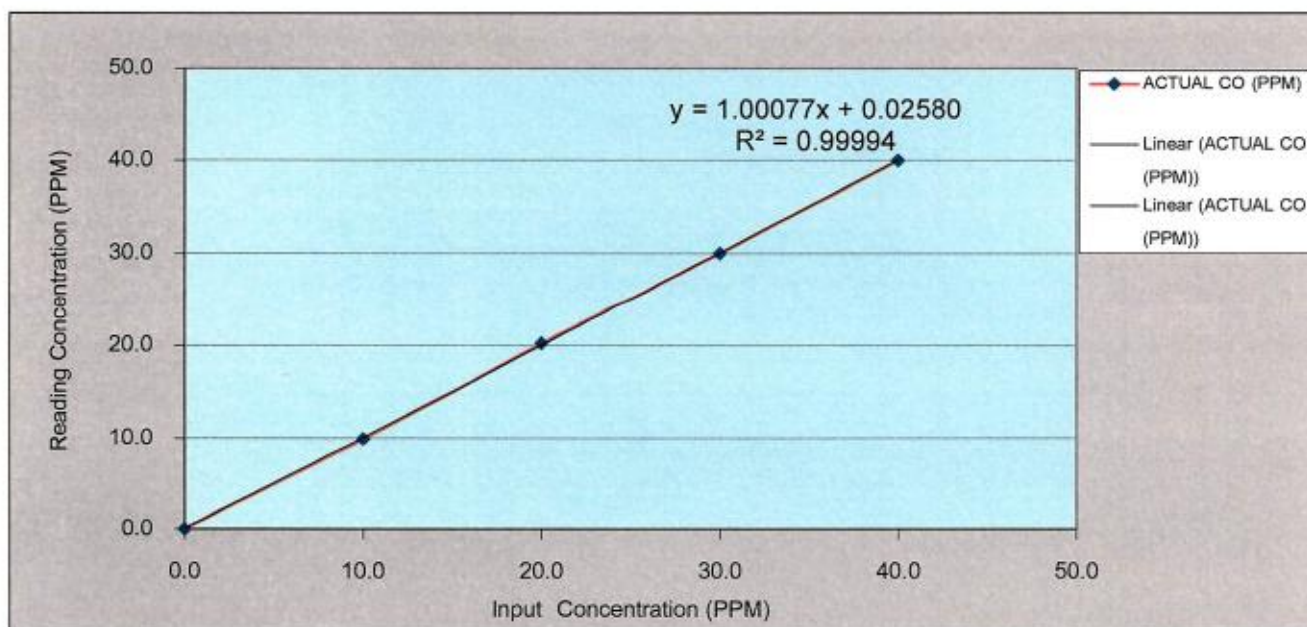
CERTIFIED DATE : Mar 10 ,2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10 ,2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.002	0.002	0.00
1	10.00	9.939	-0.061	-0.610
2	20.00	20.251	0.251	1.255
3	30.00	30.008	0.008	0.027
4	40.00	40.006	0.006	0.015
AVERAGE (%)				0.476



CALIBRATED BY :

DATE : 20 กรกฎาคม 2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม :

โทรศัพท์ : 02-515-8987

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/03/2021, 03/10/2021
NITROGEN	Balance				03/04/2021

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T100

วันที่ : 1 มีนาคม 2566

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 6200

TEST VALUES

API MODEL T100			BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0	500.0
2	SO ₂ STABILITY	≤ 1 PPB	0.21	0.12
3	PRESSURE	25 - 35 in - Hg-A	27.8	29.6
4	SAMPLE FLOW	700 ± 10% cc/min	632.6	702.7
5	PMT	mV	5.3	11.0
6	NORM PMT	mV	13.5	13.6
7	UV LAMP	1000 - 4800 mV	1615.4	3070.3
8	LAMP RATIO	30 To 120 %	39.9	75.9
9	STRAY LIGHT	≤ 100 PPB	6.7	6.5
10	DARK PMT	-50 ± 200 % mV	50.0	61.3
11	DARK LAMP	-50 ± 200 % mV	1.1	1.5
12	SO ₂ SLOPE	1.0 ± 0.3	0.977	1.015
13	SO ₂ OFFSET	< 250 mV	0.054	0.051
14	HVPS	400 - 900 V	511	511
15	RX CELL TEMP	50 ± 1 °C	50.0	50.0
16	BOX TEMP	AMBIENT ± 5 °C	38.5	32.5
17	PMT TEMP	7 ± 2 °C	8.4	8.3
18	SO ₂ SAMPLE READING	PPB	1.514	0.285
19	OPTIC TEST	2000 ± 1000 mV	1443.7	2143.8
20	ELECTRICAL TEST	2000 ± 1000 mV	1983.6	1974.5
21	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.23/ 12.15 /15.28 /-15.20	5.23/ 12.15 /15.28 /-15.20
22	ZERO GAS	0.00 PPB	-1.097	0.004
23	SPAN GAS	400.00 PPB	404.129	400.475

หมายเหตุ

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

VERIFIED

DATE 16/03/2023

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย มาติตนารักษ์

โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME :SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : SO₂ Analyzer

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NUMBER : 6200

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CC745169

CYLINDER PRESSURE (PSIG) : 1550

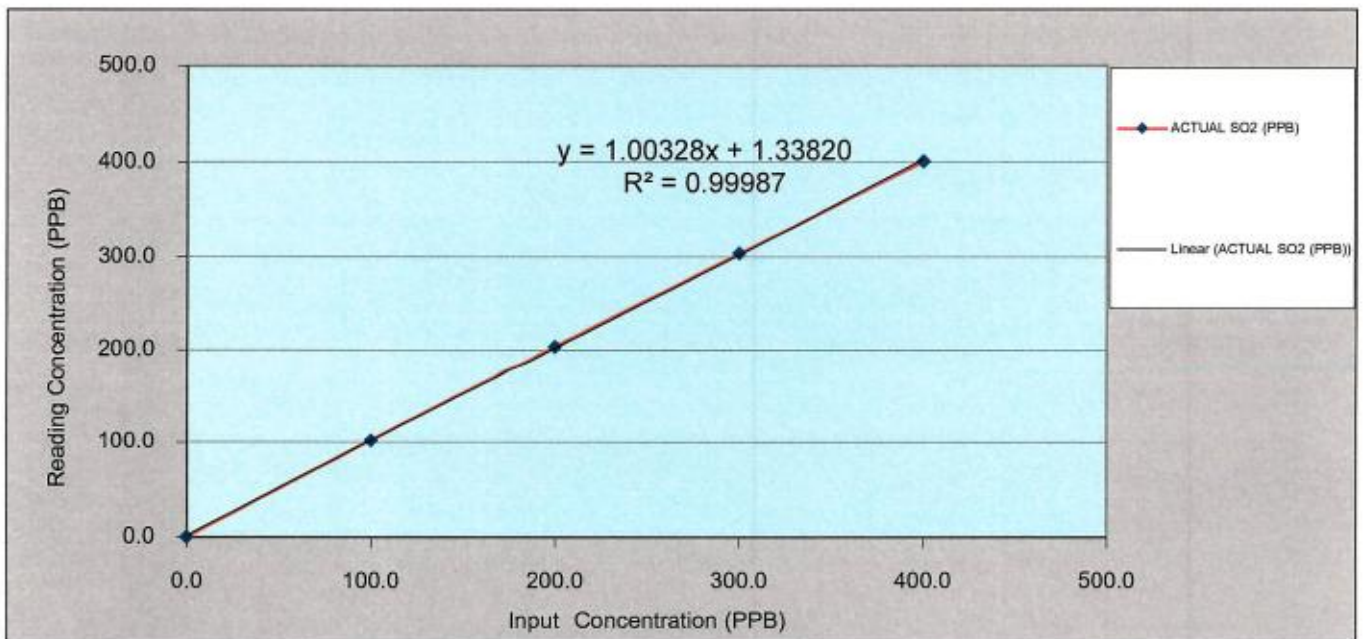
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPB)	ACTUAL SO ₂ (PPB)	ERROR SO ₂ (PPB)	% ERROR SO ₂
ZERO	0.000	0.004	0.088	0.000
1	100.000	101.675	1.675	1.675
2	200.000	203.804	3.804	1.902
3	300.000	304.008	4.008	1.336
4	400.000	400.475	0.475	0.119
AVERAGE (%)				0.010



CALIBRATED BY :

DATE : 01 /03 /2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg

Net Weight: 4.6 Kg





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T100

วันที่ : 20 พฤศจิกายน 2566

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 2512

TEST VALUES

API MODEL T100			BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500	500
2	STABILITY	≤ 1 PPB	0.24	0.03
3	PRESSURE	25 - 35 in - Hg-A	28.5	28.6
4	SAMPLE FLOW	650 ± 10% cc/min	676.4	663.9
5	PMT	mV	100.8	59.1
6	NORM PMT	mV	53.4	33.0
7	UV LAMP	1000 - 4800 mV	3012.0	3512.7
8	LAMP RATIO	30 To 120 %	91.3	99.0
9	STRAY LIGHT	≤ 100 PPB	47.2	14.8
10	DARK PMT	-50 ± 200 % mV	54.1	27.4
11	DARK LAMP	-50 ± 200 % mV	2.2	2.6
12	SO2 SLOPE	1.0 ± 0.3	1.766	0.969
13	SO2 OFFSET	< 250 mV	53.4	30.6
14	HVPS	400 - 900 V	577	566
15	RX CELL TEMP	50 ± 1 °C	50.0	50.0
16	BOX TEMP	AMBIENT ± 5 °C	30.2	30.5
17	PMT TEMP	7 ± 2 °C	8.5	8.5
18	SO2 SAMPLE READING	PPB	-4.3	1.4
19	OPTIC TEST	2000 ± 1000 mV	-	-
20	ELECTRICAL TEST	2000 ± 1000 mV	-	-
21	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.20 / 12.21 / 16.11 / -15.39	5.20 / 12.21 / 16.11 / -15.39
22	ZERO GAS	0.00 PPB	-6.4	0.2
23	SPAN GAS	400.00 PPB	361.3	400.5

หมายเหตุ

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

VERIFIED

DATE Dec 01, 2023

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ :

โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : SO2 ANALYZER

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NO : 2512

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 500

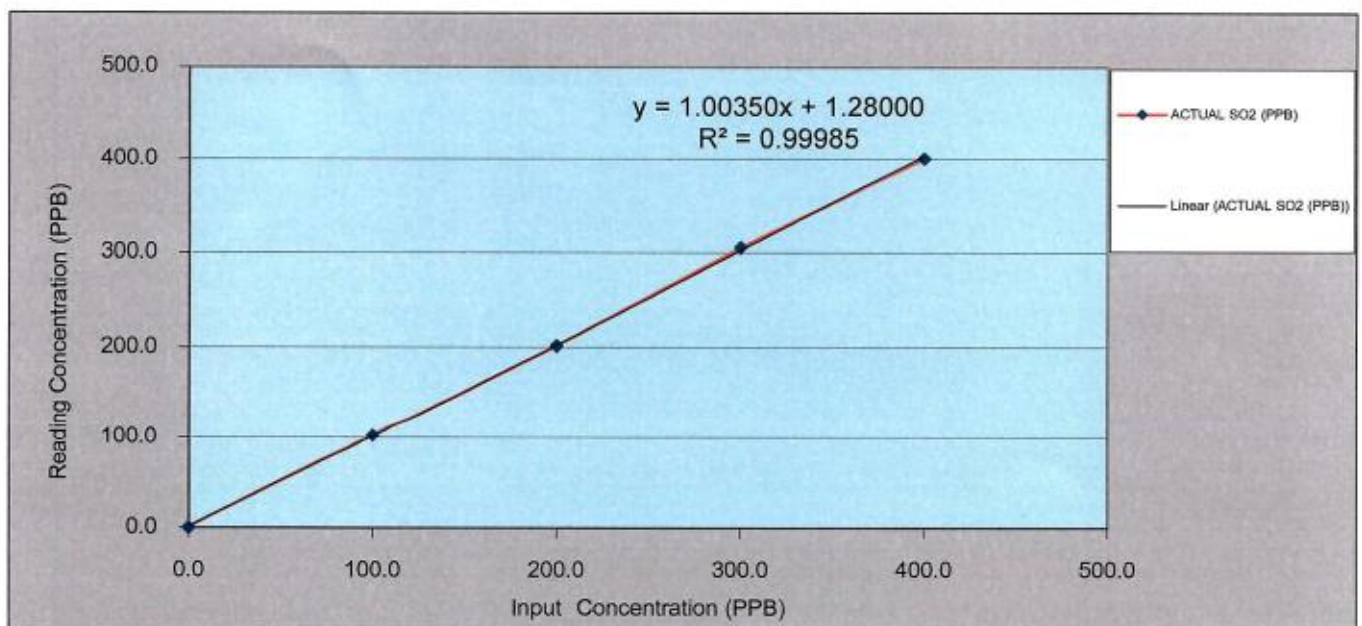
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10,2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPB)	ACTUAL SO2 (PPB)	ERROR SO2 (PPB)	% ERROR SO2
ZERO	0.0	0.2	0.2	-
1	100.0	102.3	2.3	2.3
2	200.0	201.7	1.7	0.8
3	300.0	305.2	5.2	1.7
4	400.0	400.5	0.5	0.1
AVERAGE (%)				1.3



CALIBRATED BY :

DATE : 20 พฤศจิกายน 2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม :

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8998 www.airgas.co.th

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

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 mole/mole 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	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/03/2021, 03/10/2021
NITROGEN	Balance				03/04/2021

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: BANGKOK INDUSTRIAL
GAS CO LTD
Part Number: E04NI99E80ACP0C
Cylinder Number: LL164665
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12022
Gas Code: CO,NO,NOX,SO2,BALN
Reference Number: 160-402557716-1
Cylinder Volume: 83.0 CF
Cylinder Pressure: 2215 PSIG
Valve Outlet: 660
Certification Date: Oct 21, 2022

Expiration Date: Oct 21, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800/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 mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. 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	45.00 PPM	45.01 PPM	G1	+/- 1.3% NIST Traceable	10/13/2022, 10/21/2022
NITRIC OXIDE	45.00 PPM	45.01 PPM	G1	+/- 1.2% NIST Traceable	10/13/2022, 10/21/2022
SULFUR DIOXIDE	45.00 PPM	45.11 PPM	G1	+/- 0.9% NIST Traceable	10/13/2022, 10/21/2022
CARBON MONOXIDE	4500 PPM	4511 PPM	G1	+/- 0.8% NIST Traceable	10/14/2022
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	210607-21	CC708065	48.41 PPM NITRIC OXIDE/NITROGEN	+/- 1.2%	Sep 21, 2025
PRM	12395	D887660	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 22, 2022
GMIS	124206889110	CC322674	4.474 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 25, 2025
NTRM	160102-32	KAL004062	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
NTRM	08012355	KAL004734	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Sep 22, 2022
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Oct 20, 2022
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Oct 06, 2022
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Sep 29, 2022

Triad Data Available Upon Request

NOTES: PO# 5222004798

Gross Weight: 17.2 Kg

Net Weight: 2.7 Kg

Cylinder: 80A



**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 29 June, 2023

Certification No. 246/23

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display AZ170619028 Transmitter AZ170619028

Customer : SGS (Thailand) Limited.
100 Nanglinchee Road, Chongnonsi,
Yannawa, Bangkok 10120.**VERIFIED**DATE *Jul 04, 2023*

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.9 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

: Thermoschneider No.9188 : testo, testo 645 Serial No. 02848057

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

(Authorised Signatory)

for the Chief

Sub-Standard Instrument



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 246/23

29 June, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H ₂ O	Vacumm inches H ₂ O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	3.1	-0.08
5.00	-	-	-	4.9	0.10
7.00	-	-	-	7.1	-0.10
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.1	-0.09
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.1	-0.09
17.02	-	-	-	17.0	0.02
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





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156,0-2399-0469

The Result of Calibration

Certification No. 246/23

29 June, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
759.94	761.1	-1.16
760.13	761.3	-1.17
760.67	761.8	-1.13
760.73	761.8	-1.07
757.28	758.2	-0.92
757.34	758.4	-1.06
757.52	758.6	-1.08
757.79	758.7	-0.91
758.10	759.1	-1.00
758.16	759.2	-1.04
758.66	759.7	-1.04
758.47	759.5	-1.03
758.56	759.6	-1.04
758.75	759.8	-1.05
758.98	760.1	-1.12
759.36	760.5	-1.14
756.54	757.6	-1.06
756.66	757.7	-1.04
757.00	758.1	-1.10
757.15	758.2	-1.05

Average





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 246/23

29 June, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.7	-0.2
30.2	30.3	-0.1
15.2	15.2	0.0

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 246/23

29 June, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
82.45	84	-1.55
63.55	64	-0.45
46.32	46	0.32



Calibration & Test Section
Meteorological Instruments Bureau



Date of Issue 29 June, 2023

Certification No. 246/23

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg. Code. AZ170619028 ทำการสอบเทียบกับแก้ว ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ เครื่องมือ (0.01 in/ TIP)



**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 8 March, 2023

Certification No. 077/23

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display BD190415074 Transmitter BD190415074

Customer : SGS (Thailand) Limited.
100 Nanglinchee Road, Chongnonsi,
Yannawa, Bangkok 10120.**VERIFIED**

DATE Mar 13, 2023

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1013.6 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425

: Wind Aloft Plotting Board

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

: Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer

Model DA-650-3TV

(sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

: Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

: Thermoschneider No.9188 : testo, testo 645 Serial No. 02848057

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

(Authorised Signatory)

for the Chief

Sub-Standard Instrument



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 077/23

8 March, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.8	0.21
17.02	-	-	-	17.0	0.02
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

Calibration & Test Section

Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156,0-2399-0469

The Result of Calibration

Certification No. 077/23

8 March, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
761.92	762.9	-0.98
761.58	762.7	-1.12
761.88	763.0	-1.12
762.57	763.5	-0.93
764.09	765.1	-1.01
764.13	765.2	-1.07
762.06	763.0	-0.94
761.45	762.6	-1.15
761.32	762.4	-1.08
759.85	761.0	-1.15
760.22	761.3	-1.08
760.46	761.4	-0.94
760.82	761.6	-0.78
761.26	762.2	-0.94
761.42	762.5	-1.08
761.81	762.8	-0.99
761.96	762.8	-0.84
762.54	763.3	-0.76
762.69	763.5	-0.81
758.55	759.7	-1.15

Average





THAI METEOROLOGICAL DEPARTMENT

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

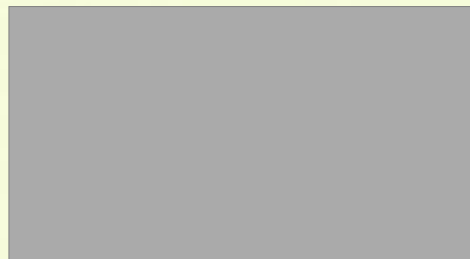
The Result of Calibration

Certification No. 077/23

8 March, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.8	-0.3
30.4	30.6	-0.2
15.8	15.9	-0.1



Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 077/23

8 March, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
85.75	81	4.75
64.53	61	3.53
46.79	44	2.79

Calibration & Test Section
Meteorological Instruments Bureau





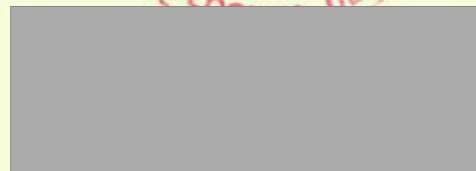
Date of Issue 8 March, 2023

Certification No. 077/23

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg. Code. BD190415074 ทำการสอบเทียบกับแก้ว ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ เครื่องมือ (0.01 in/ TIP)



วิศวกรชำนาญการ



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 8 March, 2023

Certification No. 078/23

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display BD190415073 Transmitter BD190415073

Customer : SGS (Thailand) Limited.
100 Nanglinchee Road, Chongnonsi,
Yannawa, Bangkok 10120.

VERIFIED

DATE *Mar 13, 2023*

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1014.2 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

: Thermoschneider No.9188 : testo, testo 645 Serial No. 02848057

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

(Authorised Signatory)

for the Chief

Sub-Standard Instrument



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 078/23

8 March, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.8	0.21
17.02	-	-	-	17.0	0.02
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

Calibration & Test Section

Meteorological Instruments Bureau

Mechanical Engineer



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156, 0-2399-0469

The Result of Calibration

Certification No. 078/23

8 March, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
761.92	762.9	-0.98
761.58	762.5	-0.92
761.88	762.9	-1.02
762.57	763.5	-0.93
764.09	765.1	-1.01
764.13	765.3	-1.17
762.06	763.2	-1.14
761.45	762.6	-1.15
761.32	762.5	-1.18
759.85	761.2	-1.35
760.22	761.3	-1.08
760.46	761.5	-1.04
760.82	761.8	-0.98
761.26	762.2	-0.94
761.42	762.5	-1.08
761.81	762.9	-1.09
761.96	763.0	-1.04
762.54	763.6	-1.06
762.69	763.7	-1.01
758.55	759.6	-1.05

Average

-1.06

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

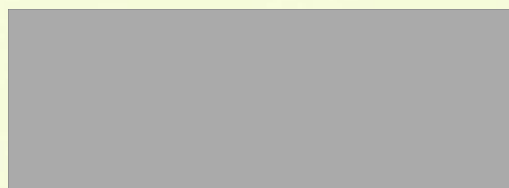
The Result of Calibration

Certification No. 078/23

8 March, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.5	0.0
30.4	30.3	0.1
15.8	15.8	0.0



Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

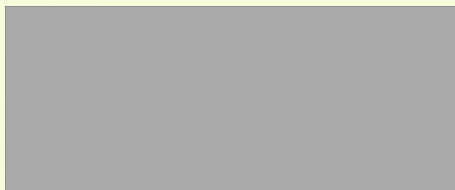
The Result of Calibration

Certification No. 078/23

8 March, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
85.75	82	3.75
64.53	63	1.53
46.79	45	1.79



Mechanical Engineer





Date of Issue 8 March, 2023

Certification No. 078/23

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg. Code. BD190415073 ทำการสอบเทียบกับแก้ว ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ เครื่องมือ (0.01 in/ TIP)




วิศวกรชำนาญการ

SINGLE-POINT CALIBRATION REPORT

Customer : SGS (THAILAND) LIMITED
 Application : Rayong Environmental Laboratory
 Location (s) : 1/209 , 1/211 Moo.1 T.Ban Chang A.Ban Chang Rayong 21130

Calibration Date : 3/10/2023
 Calibration Time : 13:30
 Calibrated by : Environmental Solution Integrator Co., Ltd.

Gas Measurement	: CH4, HCNM, THC
Measuring Range	: 0-1000 PPM
Cylinder ID Number	: ND57186
Certification Date	: Oct 24, 2013
Expiry Date	: Jul 16, 2029
K	: before calibration CH4 : 1.170
	: before calibration NMHC : 1.229
K	: after calibration CH4 : 1.84
	: after calibration NMHC : 1.869
CH4 Reading	: before calibration : 2.1 PPM
	: after calibration : 1.9 PPM
HCNM Reading	: before calibration : 0.8 PPM
	: after calibration : 0.6 PPM
THC Reading	: before calibration : 2.9 PPM
	: after calibration : 2.5 PPM

Manufacturer	 Environnement s.a L'Entrepreneur de l'Environnement
Analyzer Model	: HC51M
Serial Number	: 859
Note	: GAS METHANE CONC : 21.12 PPM : GAS PROPANE : 21.39 PPM

Zero Calibration

Gas	Before Calibration		
	Zero Adjustment	Reading	Result
CH4	0	0.03	PASS
HCNM	0.0	0.0	PASS
Note			

After Calibration		
Zero Adjustment	Reading	Result
0.0	0.0	PASS
0.0	0.0	PASS
Note		

Span Calibration

Gas	Before Calibration			
	K	Delta	Reading	Result
CH4	1.17	0	20	PASS
HCNM	1.84	0	62	PASS
Note				

After Calibration			
K	Delta	Reading	Result
1.229	0	21	PASS
1.869	0	63	PASS
Note			

Remark :



Service Engineer



Service Engineer

Report Check Sheet

Customer : SGS (THAILAND) LIMITED
Application : Rayong Environmental Laboratory
Location (s) : 1/209 , 1/211 Moo.1 T.Ban Chang A.Ban Chang
Rayong 21130

Job Number : -
Working Date : 3/10/2023
Calibrated by : Environmental Solution Integrator Co., Ltd.

Equipment : HC51M
Serial Number : 859

Manufacturer



FID		
Status	Reading	Result
Sample T°	54 C°	Passed
FID T°	151 C°	Passed
NMHC T°	210 C°	Passed
ZERO T°	416 C°	Passed
CH4 REF	1933.2	Passed
THC REF	1978.3	Passed
CH4	1.8	Passed
THC	2.4	Passed
NMHC	0.6	Passed
Sample flow	77 ml/min	Passed
Air	248 ml/min	Passed
H2 P	616 mb	Passed
Air P	954 mb	Passed
Sample P.	297 mb	Passed
Signal	3817 mv	Passed
Auto-Zero	562 mv	Passed

Mux Signals		
Status	Reading	Result
GND ((-5)-(+10)) mv	1 mv	Passed
Int.Temp. (150-550) mv	352 mv	Passed
H2 Press. (450-750) mv	616 mv	Passed
Air Press. (1100-1500) mv	954 mv	Passed
Sample Pre (200-400) mv	297 mv	Passed
Air Flow (3000-4600) mv	3173 mv	Passed
Sample Flox (2500-3900) mv	3279 mv	Passed
Signal (0-9999) mv	3527 mv	Passed
Auto-Zero (500-1500) mv	562 mv	Passed
Flame (off or on) mv	9998 mv	Passed
2V Ref (1800-2200) mv	1965 mv	Passed
Sample Ten (750-950) mv	804 mv	Passed
FID Temp. (880-980) mv	934 mv	Passed
HCNM Tem (950-1050) mv	999 mv	Passed
ZERO Temp (1095-1195) mv	1166 mv	Passed
Baro/Ext.	2 mv	Passed

Offset / Conversion			
Gas	Offset	Convers	Result
THC	0	1.053	Passed
CH4	0	0.716	Passed
HCNM	0	1.960	Passed

Remark :

Performed by



Service Engineer

Approved by



Service Engineer

Environmental Solution Integrator Co.,Ltd.

82/42 Phuthamonthon Sai 2 Road - Bangpa - Bangkok - Bangkok 10170

Phone 0-2885-0400 0-2448-3184 • Fax 0-2885-0461 • www.esithailand.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03AI99E3HA002C	Reference Number:	160-402151781-1
Cylinder Number:	ND57186	Cylinder Volume:	250.6 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2214 PSIG
PGVP Number:	A12021	Valve Outlet:	590
Gas Code:	CH4,PPN,BALA	Certification Date:	Jul 16, 2021

Expiration Date: Jul 16, 2029

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 mole/mole 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
METHANE	21.00 PPM	21.12 PPM	G1	+/- 0.6% NIST Traceable	07/13/2021
PROPANE	21.00 PPM	21.39 PPM	G1	+/- 1.2% NIST Traceable	07/16/2021
AIR	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	15060917	CC462647	49.67 PPM METHANE/AIR	+/- 0.3%	Jul 28, 2021
NTRM	012199	ALM018868	49.8 PPM PROPANE/AIR	+/- 0.6%	Apr 24, 2024

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2110295 CH4	FTIR	Jul 12, 2021
MKS FTIR 000929062 C3H8	FTIR	Jul 15, 2021

Triad Data Available Upon Request

NOTES: NET WEIGHT: 8.49kg

GROSS WEIGHT: 47.46 kg



Approved for Release

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAE0,
AMPHOE BANG PHI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok
10120

Certificate No : 23-ACT-138
Request No : Req-2023-1892

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : Cirrus
Model : CR:515
Serial Number : 88350
ID : ENSL 19175
Class : 1
Range : 94 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 \pm 2 °C)
Humidity : (50 \pm 20 %RH)
Barometric Pressure : (1013 \pm 10.0 hPa)
Received Date : 4 September 2023
Calibration Date : 18 September 2023
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

VERIFIED

DATE Sep 20, 2023

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	31 May 2024
THD Multimeter	2015	1047765	NIMT	31 January 2024

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

Note

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

Calibrated By :

Service Calibration Engineer

Approved By :

Calibration Engineer Supervisor

Issue Date : 18 September 2023

Certificate No : 23-ACT-138

Request No : Req-2023-1892

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	93.95	-0.05	-	-	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Measured (%)		
94 dB / 1000 Hz	0.07	-	0.40	2.5

Note :

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120

Certificate No : 23-SLM-088
Request No : Req-2023-0582

Unit Under Calibration Details

Measurement item :	Sound Level Meter	Microphone Class :	1
Manufacturer :	Cirrus	Microphone Model :	MK224
Model :	CR171B	Microphone S/N :	202157A
Serial Number :	G078138	Preamplifier Model :	MK170
ID :	ENSL 16127	Preamplifier S/N :	0805
Resolution :	0.1 dB	Instrument Status :	Used

Calibration Environment and Details

Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
Humidity : $50\% \text{RH} \pm 20\% \text{RH}$
Barometric Pressure : $1013 \text{ hPa} \pm 10 \text{ hPa}$
Received Date : 7 March 2023
Calibrated Date : 13 March 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svantek	Svan401	131	12 October 2023	WK Electric

Note

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

Calibrated By :



Calibration Officer

Approved By :



Calibration Engineer Supervisor

Issue Date : 13 March 2023



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

Certificate No : 23-SLM-088

Request No : Req-2023-0582

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance Limit
FAST / A / 20-140	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 94.00 dB	94.03	93.8	-0.23	93.8	-0.23	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Cirrus, Model CR:515, SN. 80400

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140		
UUC Weighting	(dB)	(± dB)
A	18.1	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140		
UUC Weighting	(dB)	(± dB)
A	-	0.10
C	19.4	0.10
Z	30.9	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit
FAST / 20-140	A	C	Z	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.4	0.5	0.6	0.50	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.6	-0.5	-0.4	0.60	1.0
8000 Hz	-1.7	-1.6	-1.7	0.70	+1.5 -2.5

Certificate No : 23-SLM-088

Request No : Req-2023-0582

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 20-140	Weighting Response curve				Limit
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	0.2	0.1	0.0	0.2	1.0
125 Hz	0.2	0.0	0.0		1.0
250 Hz	0.1	0.0	0.0		1.0
500 Hz	0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	-0.2	0.0	0.0		1.0
4000 Hz	-0.3	-0.2	0.0		1.0
8000 Hz	-0.4	-0.3	-0.1		+1.5, -2.5
16000 Hz	0.2	0.2	-0.2		+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / 20-140		UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
20-140 / A		UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-088

Request No : Req-2023-0582

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)		
139.00	139	139.0	0.0	0.3	0.8
134.00	134	134.0	0.0		0.8
129.00	129	129.0	0.0		0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.1	0.1		0.8
49.00	49	49.1	0.1		0.8
44.00	44	44.1	0.1		0.8
39.00	39	39.1	0.1		0.8
34.00	34	34.1	0.1		0.8
29.00	29	29.2	0.2		0.8
24.00	24	24.2	0.2		0.8

Certificate No : 23-SLM-088
 Request No : Req-2023-0582

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(± dB)
20-140	24.9	25.3	0.4	0.3	0.8
	114	114.0	0.0		0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 20-140	Toneburst	Ref	UUC	ERR	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(± dB)
Fast	200	136.0	136.0	0.0	0.3	0.5
	2	119.0	118.9	-0.1		+1.0, -1.5
	0.25	110.0	109.9	-0.1		+1.0, -3.0
Slow	200	129.6	129.6	0.0		0.5
	2	110.0	110.0	0.0		+1.0, -3.0
SEL	200	130.0	130.0	0.0		0.5
	2	110.0	110.0	0.0		+1.0, -1.5
	0.25	101.0	100.9	-0.1		+1.0, -3.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 20-140	REF	UUC	ERR	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
Complete cycle	135.4	135.5	+0.10	0.2	2.0
Positive half cycle	134.4	134.3	-0.10		1.0
Negative half cycle	134.4	134.3	-0.10		1.0

Certificate No : 23-SLM-088

Request No : Req-2023-0582

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 20-140	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	141.1		
Negative one-half cycle	140.9		
Deviated	0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 20-140	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	139.0		
Final	139.0		
Deviated	0.0	0.1	0.1

End of Certificate

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120

Certificate No : 23-SLM-089

Request No : Req-2023-0583

Unit Under Calibration Details

Measurement item :	Sound Level Meter	Microphone Class :	1
Manufacturer :	Cirrus	Microphone Model :	MK224
Model :	CR:171B	Microphone S/N :	211825D
Serial Number :	G078137	Preamplifier Model :	MK:170
ID :	ENSL 16126	Preamplifier S/N :	0799
Resolution :	0.1 dB	Instrument Status :	Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 7 March 2023
Calibrated Date : 13 March 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

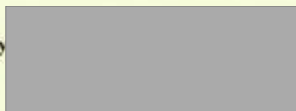
Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svantek	Svan401	131	12 October 2023	WK Electric

Note

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

Calibrated By



Calibration Officer

Approved By :



Calibration Engineer Supervisor

Issue Date :

13 March 2023

VERIFIED

DATE *Mar 13 2023*

Certificate No : 23-SLM-089

Request No : Req-2023-0583

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 94.00 dB	94.03	93.7	-0.33	93.8	-0.23	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Cirrus, Model CR:515, SN. 80400

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140		
UUC Weighting	(dB)	(± dB)
A	17.2	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140		
UUC Weighting	(dB)	(± dB)
A	-	0.10
C	16.8	0.10
Z	29.4	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / 20-140	A	C	Z		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.3	0.1	0.0	0.50	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.1	0.1	0.3	0.60	1.0
8000 Hz	0.3	0.4	0.7	0.70	+1.5 -2.5

Certificate No : 23-SLM-089

Request No : Req-2023-0583

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance Limit
FAST / 20-140	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	0.3	0.0	0.0	0.2	1.0
125 Hz	0.2	0.0	0.0		1.0
250 Hz	0.1	0.0	0.0		1.0
500 Hz	0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	-0.2	0.0	0.0		1.0
4000 Hz	-0.4	-0.2	0.0		1.0
8000 Hz	-0.4	-0.3	-0.2		+1.5, -2.5
16000 Hz	0.2	0.3	-0.2		+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit
FAST / 20-140	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit
20-140 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

Certificate No : 23-SLM-089

Request No : Req-2023-0583

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)		
139.00	139	139.0	0.0	0.3	0.8
134.00	134	134.0	0.0		0.8
129.00	129	129.0	0.0		0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.1	0.1		0.8
34.00	34	34.1	0.1		0.8
29.00	29	29.1	0.1		0.8
24.00	24	24.2	0.2		0.8

Certificate No : 23-SLM-089

Request No : Req-2023-0583

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(± dB)
20-140	29.2	29.5	0.3	0.3	0.8
	114	114.0	0.0		0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 20-140	Toneburst	Ref	UUC	ERR	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(± dB)
Fast	200	136.0	136.0	0.0	0.3	0.5
	2	119.0	118.9	-0.1		+1.0, -1.5
	0.25	110.0	109.9	-0.1		+1.0, -3.0
Slow	200	129.6	129.5	-0.1		0.5
	2	110.0	109.9	-0.1		+1.0, -3.0
SEL	200	130.0	130.0	0.0		0.5
	2	110.0	109.9	-0.1		+1.0, -1.5
	0.25	101.0	100.9	-0.1		+1.0, -3.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 20-140	REF	UUC	ERR	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
Complete cycle	135.4	135.2	-0.20	0.2	2.0
Positive half cycle	134.4	134.2	-0.20		1.0
Negative half cycle	134.4	134.2	-0.20		1.0

Certificate No : 23-SLM-089

Request No : Req-2023-0583

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 20-140	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	141.3		
Negative one-half cycle	141.4		
Deviated	-0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 20-140	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	139.0		
Final	139.0		
Deviated	0.0	0.1	0.1

End of Certificate

INNOVATIVE INSTRUMENT CALIBRATION LAB
 INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
 7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAE0.
 AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
 TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120

Certificate No : 23-SLM-041

Request No : Req-2023-0295

Unit Under Calibration Details

Measurement item : Sound Level Meter
 Manufacturer : Cirrus
 Model : CR:161B
 Serial Number : G078054
 ID : ENSL 16122
 Resolution : 0.1 dB

Microphone Class : 1
 Microphone Model : MK224
 Microphone S/N : 206565A
 Preamplifier Model : KM:170
 Preamplifier S/N : 0824
 Intrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
 Humidity : 50 %RH ± 20 %RH
 Barometric Pressure : 1013 hPa ± 10 hPa
 Received Date : 2 February 2023
 Calibrated Date : 9 February 2023
 Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svantek	Svan401	131	12 October 2023	WK Electric

Note

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

Calibrated By :



Calibration Officer

Approved By :



Calibration Engineer Supervisor

Issue Date : 9 February 2023



Certificate No : 23-SLM-041

Request No : Req-2023-0295

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance
FAST / A / 20-140	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		(± dB)
1000 Hz 94.00 dB	93.81	93.7	-0.11	93.8	-0.01	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140	(dB)	(± dB)
UUC Weighting		
A	19.7	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140	(dB)	(± dB)
UUC Weighting		
A	-	0.10
C	18.2	0.10
Z	31.1	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 20-140	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
125 Hz	0.5	0.3	0.2	0.50	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.8	-0.7	-0.3	0.60	1.0
8000 Hz	0.2	0.5	0.9	0.70	+1.5 -2.5

Certificate No : 23-SLM-041

Request No : Req-2023-0295

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 20-140	Weighting Response curve				Limit
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	0.2	0.0	0.0	0.2	1.0
125 Hz	0.2	0.0	0.0		1.0
250 Hz	0.2	0.0	0.0		1.0
500 Hz	0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	-0.2	0.0	0.0		1.0
4000 Hz	-0.4	-0.2	0.0		1.0
8000 Hz	-0.5	-0.4	-0.1		+1.5, -2.5
16000 Hz	0.1	0.2	-0.3		+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 20-140	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
20-140 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-041

Request No : Req-2023-0295

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)		
139.00	139	139.0	0.0	0.3	0.8
134.00	134	134.0	0.0		0.8
129.00	129	129.0	0.0		0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.0	0.0		0.8
34.00	34	34.0	0.0		0.8
29.00	29	29.1	0.1		0.8
24.00	24	23.9	-0.1		0.8

Certificate No : 23-SLM-041

Request No : Req-2023-0295

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance
FAST / A	REF	UUC	ERR		Limit
UUC Range	(dB)	(dB)	(dB)		(± dB)
20-140	25.3	25.4	0.1	0.3	0.8
	114	114.0	0.0		0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance
A / 20-140	Toneburst	Ref	UUC	ERR		Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(± dB)
Fast	200	136.0	136.0	0.0	0.3	0.5
	2	119.0	118.9	-0.1		+1.0, -1.5
	0.25	110.0	109.9	-0.1		+1.0, -3.0
Slow	200	129.6	129.6	0.0		0.5
	2	110.0	110.0	0.0		+1.0, -3.0
SEL	200	130.0	130.0	0.0		0.5
	2	110.0	110.0	0.0		+1.0, -1.5
	0.25	101.0	101.0	0.0		+1.0, -3.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance
FAST / C / 20-140	REF	UUC	ERR		Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
Complete cycle	135.4	135.6	+0.20	0.2	2.0
Positive half cycle	134.4	134.2	-0.20		1.0
Negative half cycle	134.4	134.2	-0.20		1.0

Certificate No : 23-SLM-041

Request No : Req-2023-0295

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 20-140	UUC		(± dB)
STD Setting	(dB)		(± dB)
Positive one-half cycle	143.7		
Negative one-half cycle	143.6		
Deviated	0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 20-140	UUC		(± dB)
STD Setting	(dB)		(± dB)
Initial	139.0		
Final	139.0		
Deviated	0.0	0.1	0.1

End of Certificate



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand



81 Moo 11 Bangkruai - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155

Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 23V030

Reference No. : CBLUE01V008

Received Date : 17 March 2023

Calibrated Date : 30 March 2023

Page 1 of 5

Client : SGS (Thailand) Limited

Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120

Equipment : VIBRATION METER

Manufacture /Brand : INSTANTEL

Model : Micromate

Serial No./ ID No. : UM7004 / ENSL 16119

VERIFIED

DATE Apr 11, 2023

Authorised Signatory

Issue Date 3 / Apr. / 2023

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration services and environmental analysis department. This reported measurement result relates only the measurand and applies only at the time of measurement.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number.

23V030

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Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Bruel & Kjaer	1242376	AV-0003-23	23 January 2025
Accelerometer Type 8305	Bruel & Kjaer	2378223	AV-0012-22	11 July 2024
Digital Multimeter /8846A	FLUKE	4330020	22E507	26 September 2023

Ambient Environment :

The Calibration was performed in an environment of (23 ± 2) °C and (50 ± 10) % relative humidity.

Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor $k = 2$. The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 23V030

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DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Vertical			
Frequency (Hz)	mm/s_p	mm/s_p	± mm/s_p
*20	10.00	10.40	0.15
*30	10.00	10.27	0.15
40	10.00	10.16	0.15
80	10.00	10.09	0.15

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

Tranducer Part : ENSL 16119

Condition : Installation by vertical direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 23V030

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Transverse			
Frequency (Hz)	mm/s_p	mm/s_p	± mm/s_p
*20	10.00	10.39	0.15
*30	10.00	10.10	0.15
40	10.00	10.05	0.15
80	10.00	9.95	0.14

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

Tranducer Part : ENSL 16119

Condition : Installation by Transverse direction



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 23V030

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
Longitude			
Frequency (Hz)	mm/s _p	mm/s _p	± mm/s _p
*20	10.00	10.38	0.15
*30	10.00	10.20	0.15
40	10.00	10.11	0.15
80	10.00	10.02	0.15

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

Tranducer Part : ENSL 16119

Condition : Installation by Longitude direction

**** End Certificate of Calibration ****

Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260

+662 723 0382


MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: SGS (THAILAND) CO.,LTD.
Address: 1/209,1/211 Moo 1, Ban Chang
City: Ban Chang **Contact:** Hatairat Linjee
Zip / Postal: 21130
State / Province: Rayong
Order Number: 
0 3 3 2 7 1 0 0 6 1

Weighing Device

Manufacturer: Mettler Toledo **Instrument Type:** Weighing Instrument
Model: XS205DU **Asset Number:** N/A
Serial No.: B036065880 **Terminal Model:** SAT
Building: LABORATORY **Terminal Serial No.:** B036065880
Floor: 1 **Terminal Asset No.:** N/A
Room: BalanceLab

Range	Max. Capacity	Readability (d)
1	81 g	0.00001 g
2	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

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.

	Temperature		Humidity	
As Found	Start: 20.1 °C	End: 19.9 °C	Start: 71.6 %	End: 60.2 %

As Found Calibration Date: 14-Mar-2023
As Left Calibration Date: N/A
Issue Date: 15-Mar-2023

Calibrator:

Approved Signatory:



Technical Manager / Head of Calibration Center

Measurement Results

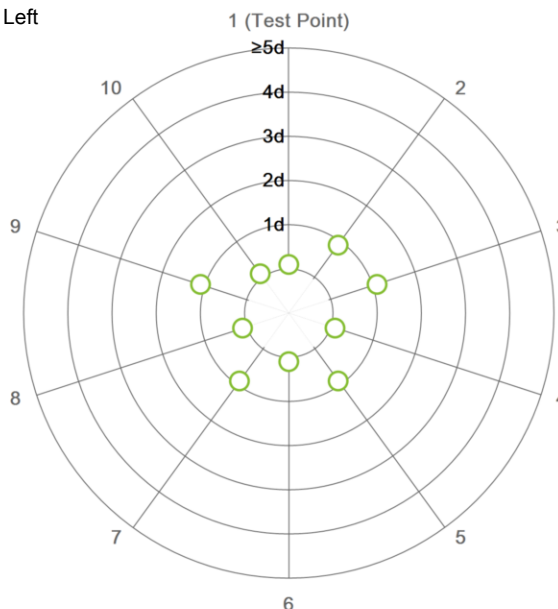
Repeatability

Test Load: 70 g

	As Found	As Left
1	70.00005 g	N/A
2	70.00004 g	N/A
3	70.00006 g	N/A
4	70.00005 g	N/A
5	70.00004 g	N/A
6	70.00005 g	N/A
7	70.00004 g	N/A
8	70.00005 g	N/A
9	70.00006 g	N/A
10	70.00005 g	N/A

Standard Deviation	0.000007 g	N/A
--------------------	------------	-----

○ As Found
◆ As Left



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

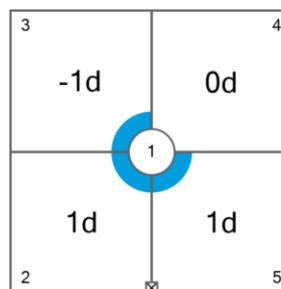
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0001 g	N/A
3	99.9999 g	N/A
4	100.0000 g	N/A
5	100.0001 g	N/A

Maximum Deviation	0.0001 g	N/A
-------------------	----------	-----



As Found

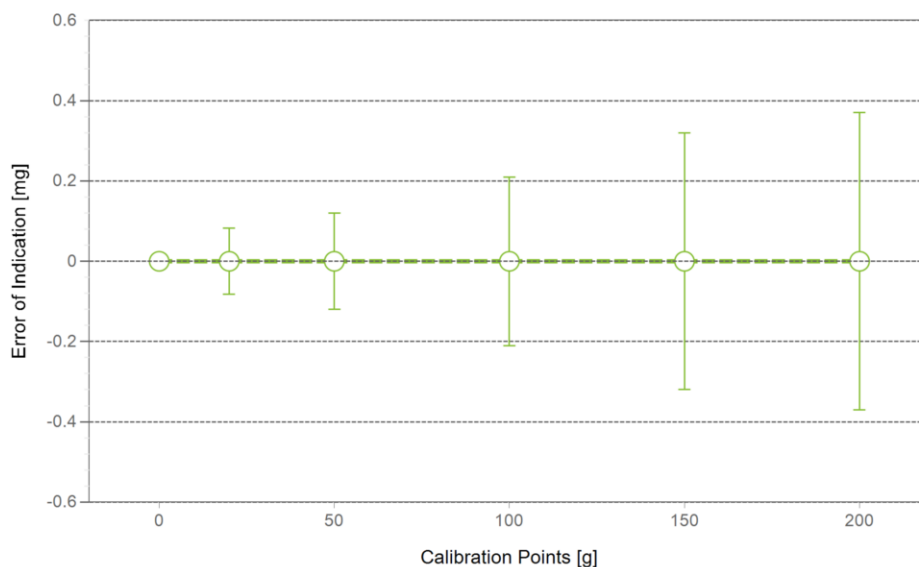
The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.016 mg	2
2	0.01000 g	0.01000 g	0.00000 g	0.018 mg	2
3	0.10000 g	0.10000 g	0.00000 g	0.022 mg	2
4	0.99999 g	0.99998 g	-0.00001 g	0.032 mg	2
5	4.99998 g	4.99997 g	-0.00001 g	0.048 mg	2
6	9.99999 g	10.00000 g	0.00001 g	0.061 mg	2
7	20.00000 g	20.00000 g	0.00000 g	0.082 mg	2
8 ¹	50.00005 g	50.00005 g	0.00000 g	0.12 mg	2
9	100.0001 g	100.0001 g	0.0000 g	0.21 mg	2
10	150.0001 g	150.0001 g	0.0000 g	0.32 mg	2
11	200.0001 g	200.0001 g	0.0000 g	0.37 mg	2

¹The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



○ As Found

◆ As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

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.:	WS28	Date of Issue:	01-Apr-2022
Certificate Number:	178498	Calibration Due Date:	17-Sep-2023

Thermo Hygrometer

Equipment No.:	IN51	Date of Issue:	17-Feb-2023
Certificate Number:	SG-H-00144/66	Calibration Due Date:	15-Feb-2024

Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

End of Accredited Section

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

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: $1.5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

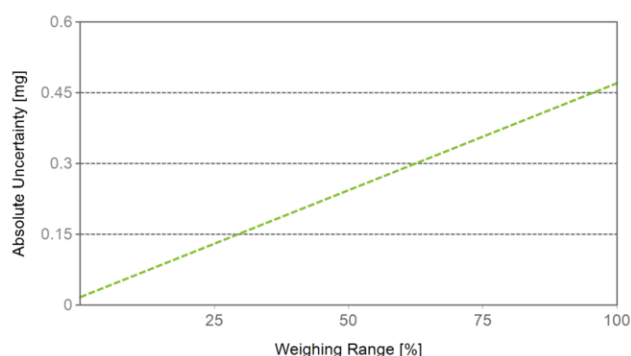
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.00001 g	81 g	$U_1 = 0.017 \text{ mg} + 0.00560 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.00554 \text{ mg/g} \cdot R$	N/A

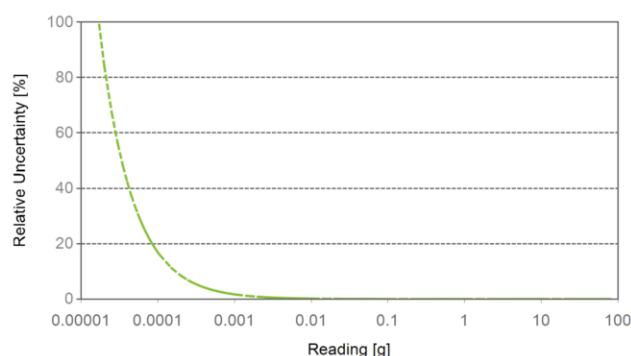
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.00220 g	0.017 mg	0.77%	N/A	N/A
0.02200 g	0.017 mg	0.078%	N/A	N/A
0.22000 g	0.018 mg	0.0083%	N/A	N/A
2.20000 g	0.029 mg	0.0013%	N/A	N/A
220.0000 g	1.3 mg	0.00058%	N/A	N/A



As Found



As Left

The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

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.

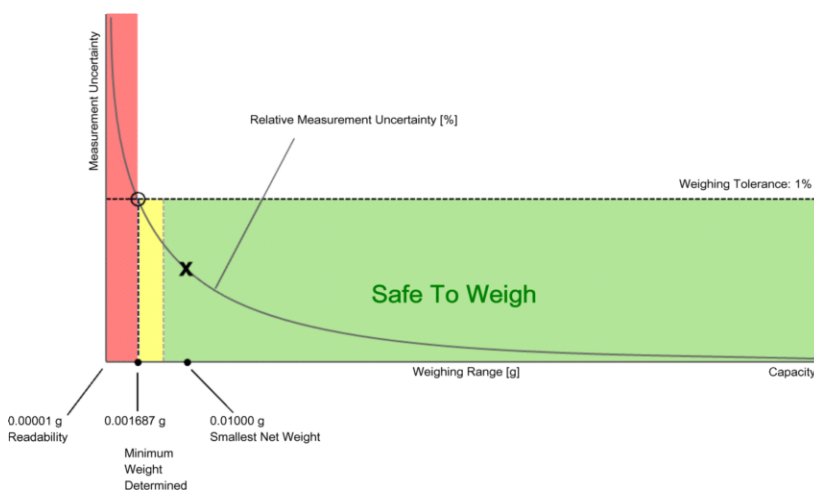
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.01000 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 testing, unless only As Found was performed.

Minimum Weight

As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016961 g	0.034113 g	0.051461 g	0.086758 g	0.178664 g
0.2%	0.008456 g	0.016961 g	0.025513 g	0.042763 g	0.086758 g
0.5%	0.003377 g	0.006761 g	0.010153 g	0.016961 g	0.034113 g
1%	0.001687 g	0.003377 g	0.005068 g	0.008456 g	0.016961 g
2%	0.000844 g	0.001687 g	0.002532 g	0.004222 g	0.008456 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001687 g	0.003377 g

The minimum weight table applies to the fine range of the weighing device.



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

As Left Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016961 g	0.034113 g	0.051461 g	0.086758 g	0.178664 g
0.2%	0.008456 g	0.016961 g	0.025513 g	0.042763 g	0.086758 g
0.5%	0.003377 g	0.006761 g	0.010153 g	0.016961 g	0.034113 g
1%	0.001687 g	0.003377 g	0.005068 g	0.008456 g	0.016961 g
2%	0.000844 g	0.001687 g	0.002532 g	0.004222 g	0.008456 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001687 g	0.003377 g

The minimum weight table applies to the fine range of the weighing device.



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 past, 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

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 70 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	0.000005 g	0.000007 g	✗	0.000007 g	✗
0.2%	0.000010 g		✓		⚠
0.5%	0.000025 g		✓		✓
1%	0.000050 g		✓		✓
2%	0.000100 g		✓		✓
5%	0.000250 g		✓		✓

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		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0001 g	✓	0.0001 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 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**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.00000 g	0.00000 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
50.00005 g	0.00000 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0001 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0001 g	0.0000 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0000 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.00000 g	0.00000 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
50.00005 g	0.00000 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0001 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0001 g	0.0000 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0000 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 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.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23LM127

Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor

Manufacturer : YSI

Model : 5000

Serial No. : 17E101765

ID No. : D2017006

Submitted by : SGS (Thailand) Limited
1/209, 1/211 Moo 1 T.Ban Chang,
A.Ban Chang,
Rayong 21130

Location : TPA On Site Calibration Laboratory

Received Order : 27 July 2023

Calibrated Date : 31 July 2023

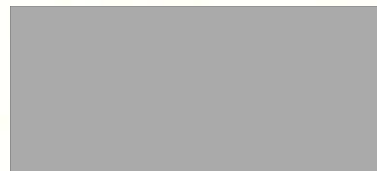
Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Preecha Hlahib

Approved by :



Issue Date : 8 August 2023

The Uncertainties are for a confidence probability of approximately 95%

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

A 0056944



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2307-0902WSC-2

Cert. No.: 23LM127
Page.: 2 of 2

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Digital Thermometer	2188080	2211285	TPA	21 Oct 2023

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

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

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: D2017006

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
20.00	100	20.008	19.93	-0.078	0.15	2.00

UUC* : Unit Under Calibration

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

-o0o-

Customer Contact:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang
A Banchang
RAYONG 21130
TAX ID : 0105532106079
Saijai.Ruangawat@sgs.com
038-685 260-4

Invoice To:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang A
Banchang RAYONG 21130

Delivery Site:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang
A Banchang
RAYONG 21130

Location:

Room
Bldg
Lab
Dept

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70205138
Service Request:	Service Request Date:
Service Order: 6006193099	Service Confirmation: 6904997715

Direct Inquiries to:

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

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Bangkok 10500 Thailand
Tax ID : 0105542068218

Citibank N.A. Bangkok Branch
399 Interchange 21 Building, Sukhumvit Road, Klongtoey Nau
Sub-district, Wattana District, Bangkok 10110 Thailand
Acc. No: 012-4452-007 ,
THB:Krung Thai Bank PCL
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330
Thailand

ORIGINAL

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-GM-5973T	GCMS 5973 Turbo System			
G2579A	5973 Inert MSD Perform Turbo EI Mainfrm	US30965023		SYS-GM-5973T
G1530N	6890N Network GC System	CN10305014	G2004002	SYS-GM-5973T

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	PM	Preventive Maintenance	1.00	Agreement Entitlement - 100 % covered	27.06.2023	27.06.2023
1010	5188-6496	QuickPick Split Vent + Inlet PM Kit	1.00	Agreement Entitlement - 100 % covered		
1020	5188-6497	QuickPick Splitless Inlet/Vent PM Kit	1.00	Agreement Entitlement - 100 % covered		
1030	5191-5851	Agilent Vacuum Fluid 45 Platinum, 1Qt	1.00	Agreement Entitlement - 100 % covered		
1050	G1099-80039	Oil Mist Filter, 3/8 BSP Male Threads	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Service Information:**Problem Description:**

NR-C-PM-GM5973-5001151743

Service Provided:

PM 6890N/5973 MSD. Clean source and replace all consumable parts.

Service Overview Code:

Reason Code: Scheduled Service

Diagnosis Code: Scheduled Service

Resolution Code: Scheduled Service

Reported Hours:

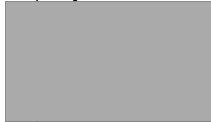
5.0

Travel Hours:

2.0

Customer Field Service**Representative Name:**

Eaknarin Puangsopa

Customer Field Service**Representative Signature:****Date:**

28 Jun 2023

Customer Name:

Kritsana Longbangplee

Customer Signature:**Date:**

28 Jun 2023

Additional Comments:

PlasmaQuant® MS (Elite) ICP-MS



1 Customer and service data

Customer data

Company	SGS
Department	
Name	
Address (Street, Number, ZIP code, City)	Sukhumvit Road, Ban Chang District, Rayong
Telephone	
E-Mail	
Customer no.	
Order no.	

Device data

Device Type	PQMS Elite
Serial number	10-5000-030-26-AR109

Data of the authorized person for the Maintenance

Name, Company	Analytik-Jena Instrument Thailand
Date of the Maintenance	19 April 2023

	yes	no
Maintenance with following Operational Qualification OQ (requires a separate OQ protocol)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2 Maintenance Checklist

Tick each checkbox as the steps are completed.

Parts required

<input checked="" type="checkbox"/>	10-5000-220-20	Kit preventative maintenance ICP-MS
<input checked="" type="checkbox"/>	13-410-540	Cooling Water Additives
Choose one of the following oil types as it is important for rotary pump type:		
<input type="checkbox"/>	418-88089-0	Vacuum Pump Oil (Esther Oil LVO 200)
<input checked="" type="checkbox"/>	418-10-406-251	Vacuum Pump Oil (PFPE Oil LVO 420) <i>inspected</i>

Initial performance tests

<input checked="" type="checkbox"/>	Print out Details, Plasma Align (Time Scan mode), Res & Trim, Mass Call, Detector Setup, Mass Scan (after new scan with tuning solution), Vacuum (Gate Valve opened and closed), iCRC, Ion Optics and Stepper pages from the instrument setup
<input checked="" type="checkbox"/>	Verify performance (sensitivity/oxides/double charges) of system before starting maintenance

Vacuum system

<input checked="" type="checkbox"/>	Drain and replace oil in rotary pump. <i>inspected</i>
<input checked="" type="checkbox"/>	Clean exterior of pump.
<input checked="" type="checkbox"/>	Test vacuum interlock by attempting to start vacuum with Turbo pump #1 dismounted. Verify that appropriate error message is displayed.

Mass spectrometer system

<input checked="" type="checkbox"/>	Check/adjust gate valve.
<input checked="" type="checkbox"/>	Clean sampler/skimmer cones/replace O-rings.
<input checked="" type="checkbox"/>	Check quadrupole resolution and check Quad Controller resonance. Resonance peak voltage is <i>2.7 V</i>
<input checked="" type="checkbox"/>	Clean entrance lens and entrance plate Detector voltage is: <i>3113 V.</i>

Sample introduction system

<input checked="" type="checkbox"/>	Inspect torch.
<input checked="" type="checkbox"/>	Inspect/replace torch gas tubing.
<input checked="" type="checkbox"/>	Inspect/clean/adjust RF coil.
<input checked="" type="checkbox"/>	Inspect igniter/replace ignitor cable.
<input checked="" type="checkbox"/>	Clean sampler/skimmer cones/replace O-rings.
<input checked="" type="checkbox"/>	Clean extraction lenses #1 and #2.
<input checked="" type="checkbox"/>	Remove nebulizer from spray chamber. Turn on the peristaltic pump (15 rpm) and nebulizer gas flow (1.0 L/min) and aspirate de-ionized water. Check that the aerosol produced by the nebulizer is normal and uniform.
<input checked="" type="checkbox"/>	Check spray chamber and replace all O-rings and water tubing.
<input checked="" type="checkbox"/>	Inspect sample introduction system electrical connections.

Water cooling system

<input checked="" type="checkbox"/>	Drain water reservoir.
<input checked="" type="checkbox"/>	Clean air intake filters & heat exchange fins as needed.
<input checked="" type="checkbox"/>	Inspect all water hoses for cracks/leaks.
<input checked="" type="checkbox"/>	Disassemble inline water filter & clean cartridge.
<input checked="" type="checkbox"/>	Fill water reservoir with additives and check the water conductivity according to instruction. <i>97 μS/cm.</i>
<input checked="" type="checkbox"/>	Inspect mains cable and plug.
<input checked="" type="checkbox"/>	Turn on and re-check water level.
<input checked="" type="checkbox"/>	Check pressure (440 \pm 40 kPa) and temperature set point (20 °C); adjust if necessary.
<input checked="" type="checkbox"/>	Verify operation of the water solenoid.

Basic instrument

<input checked="" type="checkbox"/>	Inspect condition of argon supply hose.
<input checked="" type="checkbox"/>	Inspect mains power cable and plug.
<input checked="" type="checkbox"/>	Check operation of exhaust system and inspect airflow sensor; if necessary clean according to instruction. <i>2.38 V.</i>
<input checked="" type="checkbox"/>	Inspect USB and serial cables/connections.
<input checked="" type="checkbox"/>	Clean all external covers and fans.
<input checked="" type="checkbox"/>	Check argon inlet pressure if it is at recommended pressure of 700 kPa (100 psi) (allowed range is 600 to 830 kPa, 90 to 120 psi) Actual setting is <i>100</i> kPa/psi.
<input checked="" type="checkbox"/>	Check iCRC for leakage and blockage according to service info. Check gas pressures: He ~150 kPa (22 psi), H ₂ ~100 kPa (16 psi)

Interlock Tests

- ☒ Turn off argon supply and ignite plasma. Verify if low argon error message is displayed.
- ☒ Ignite plasma and press emergency stop button. Verify that plasma goes out and appropriate error message is displayed.
- ☒ Ignite plasma and unlatch plasma compartment/main RF door. Verify that plasma goes out and appropriate error message is displayed.
- ☒ Ignite plasma and turn off argon supply. Check if plasma is turned off and appropriate low argon flow message is displayed.
- ☒ Turn off water cooler and light plasma. Verify if appropriate error message is displayed.

Accessories

- ☒ Verify initialization and operation of auto sampler. Check belts and wheels etc.
- ☒ Check all other accessories.

Performance tests

- ☒ Update entries in Details page of Instrument Setup window as required.
- ☒ Print out every section of the Instrument Setup (service mode) and put it into the logbook.
- ☒ Tune up instrument and run performance test. Perform any corrective action necessary if results do not meet specifications. Add performance test results to logbook.

Instrument condition

- ☒ Assess and comment on condition of ICP-MS system
- ☒ Discuss condition, preventative maintenance results and instrument performance with the customer.
- ☒ Sign and date this checklist after obtaining customer's signature.

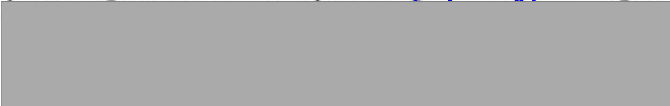

Instrument and environmental conditions

- | | | |
|--|-------------------------------|-------------------------------|
| <input checked="" type="checkbox"/> Good | <input type="checkbox"/> Fair | <input type="checkbox"/> Poor |
|--|-------------------------------|-------------------------------|

Comments and recommendations:

- recommend to replace skimmer cone and sampler cone due to degraded the cone's hole become bigger and not in a good shape.
- Nebulizer
The inlet Argon port is broken.

Service Report

Customer's address :		Customer's Ref. No.	
SGS			
Sukhumvit Road, Ban Chang			
District, Rayong			
E-mail :		Phone :	Fax :
Job No. 2304216PM	User :	Service Engineer : Somchi N	Date : 18-19/04/2023 Page : 1 / 1
Instrument model : PQMS Elite	Serial No. 10-5000-030-26-AR109	Software Version No. 4.3.3	
<input type="checkbox"/> Repair (RE) <input checked="" type="checkbox"/> Maintenance (PM) <input type="checkbox"/> Installation (IN) <input type="checkbox"/> Warranty <input type="checkbox"/> Application (AP) <input type="checkbox"/> Site Prep. (SP) <input type="checkbox"/> Visit (VI)			
Fault / Claim :			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Error Code
PM 1/2 - 2023			
Action taken :			
<ul style="list-style-type: none"> - clean water cooling system, Replace water type 1 and adjust water conductivity = 95 μS/cm, pressure 4.0 bar. - clean water filter, clean water inlet solenoid valve - replace Assy flow sensor 10-5100-700-96 1 ea. - replace skimmer cone's o-ring, sampler cone's o-ring. - replace activated Alumina (Vacuum oil trap). - inspect spray chamber's o-ring, Nebulizer's o-ring — OK. - clean instrument cooling Fan - inspect Exhaust Sensor = 2.38 V. - perform plasma alignment Ver 2 Hor, Resolution & trim, Mass calibration, Detector set up Voltage = 3413 V. - Performance test with 1 ppb tuning std, instrument working properly. 			
Action Pending / Recommendation :			
recommend to replace - skimmer cone and sampler cone (degraded) - Nebulizer (broken at inlet Argon port)			
<input type="checkbox"/> Spare Part <input type="checkbox"/> Instrument Configuration			
Item No.	Name	Quantity	Unit Price
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Herewith the undersigned confirm the time devoted, the work performed, the perfect function of the device, and the receipt/delivery of the specified spare parts. *Traveled hours and kilometers can only be entered after the return of the service engineer.		Date / Signature of Customer 	Date / Signature of Service Engineer 
		Work completed?	
		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

DISTRIBUTOR
AJITH

skimmer

sampler



Report Date 2023-04-19 11:45:44 GMT+07:00

Worksheet System Test 19 Apr 2023 w Th.msws

Analyst

Worksheet Summary

Worksheet: System Test 19 Apr 2023 w Th.msws
Created: 2020-06-03 07:36:54
Analyst:
Computer: APPLICATIONICP
Last Saved: 2023-04-19 11:28:28 GMT+07:00
Software Ver.: 4.3 r19995
Firmware Ver.: 5.69
Samples: 1
Comment:

Chemistry

Matrix:
Acids Used:
Keywords:
CRM:

Measurement Parameters

Analysis Modes Analysis Type: Quantitative, Acquisition Mode: Steady State, Scan Mode: Peak Hopping
Spacing: Coarse, Points/Peak: 1, Scans/Replicate: 50, Replicates/Sample: 10

Plasma Plasma flow: 9.00 L/min Auxiliary flow: 1.35 L/min Sheath Gas Flow: 0.00 L/min Nebulizer flow: 1.04 L/min
Sampling depth: 6.00 mm
Power: 1.20 kW Pump rate: 20 rpm Stabilization delay: 30 sec Nitrox Flow: 0.00 mL/min

Ion Optics (Volt)

Skimmer Bias: 0.00
First Extraction Lens: -63.00 Second Extraction Lens: -620.00 Third Extraction Lens: -499.00
Left Mirror Lens: 71.00 Right Mirror Lens: 59.00 Bottom Mirror Lens: 47.00
Corner Lens: -446.00 Entrance Lens: 4.00
Fringe Bias: -5.50 Entrance Plate: -60.00
Detector Focus: True Pole Bias: 0.00

iCRC Skimmer Cone: Off iCRC Skimmer Gas Flow: 0 mL/min

Nitrox 0 mL/min

Sampling Aerosol generation: Nebulizer, Source: Manual
Fast pump during sample delay/rinse: On, Enable device control: Off
Spray Chamber Cooling: On Spray Chamber Temp: 3.00 °C
Sample uptake delay: 30 sec, Smart Rinse: No, Switch Delay: OFF
Scan time: 1407 msec, Replicate time: 70.35 sec

Analytes (6)

Be9, Co59, In115, Ce140, Pb208, Th232

SemiQuant Analytes (0)

Internal Standards (0)

No. of isotope ratio standards: 0

Isotope Ratios (2)

CeO/Ce(Ce140O16/Ce140), Ba++/Ba(Ba138++/Ba138)

Default exclusions (7)

Ar40, Ar40Ar40, N14, N14H1, O16, O16H1, Ar40H1

User-specified exclusions (0)

Scan Segments (11)

Start (m/z)	Stop (m/z)	Dwell (µsec)	Attenuation	mode	Norm-Med	Med-High
5	5	60000		None		
8	10	60000		None		
58	60	60000		None		
69	69	60000		None		
114	116	60000		None		
138	140	60000		None		
156	156	60000		None		
207	209	60000		None		
220	220	60000		None		
228	228	60000		None		

Report Date 2023-04-19 11:45:44 GMT+07:00

Worksheet System Test 19 Apr 2023 w Th.mswws

Analyst

Start (m/z)	Stop (m/z)	Dwell (µsec)	Attenuation mode	Norm-Med	Med-High
231	233	60000	None		

1 ppb Tuning solution [1 ppb Tuning solution]

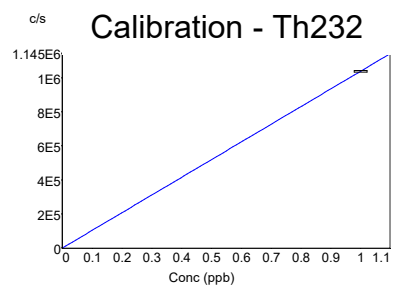
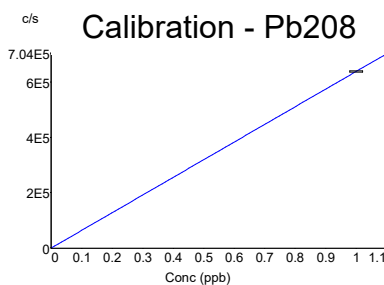
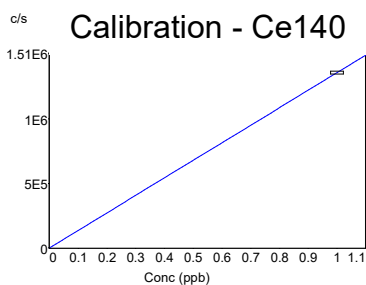
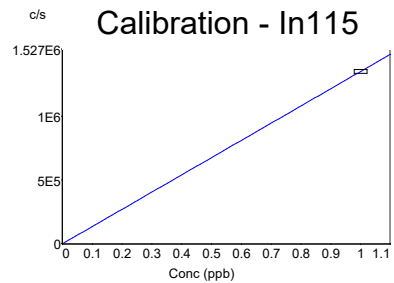
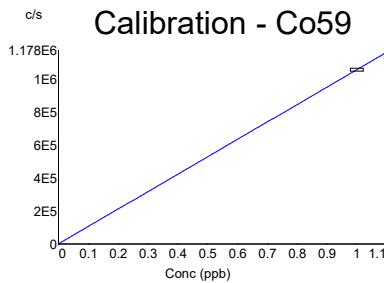
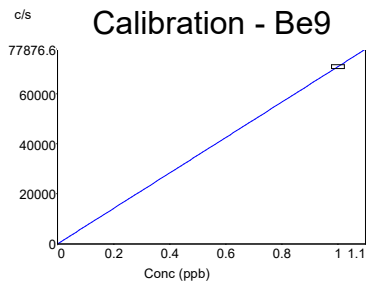
Tube: 2, Replicates: 10, Auto Dilutions factor: -, Cal Set 1, Time measured: 2023-04-19 11:28:28

Actual weight: 1.0000 g, Actual volume: 1.00 mL, Dilution Factor: 1.00

Position Horizontal: -0.10 mm Position Vertical: -0.10 mm Detector Voltage: 3113.30 volt

Analyte	Soln Conc	Unit	QC	Mean c/s	%RSD	SD	Replicates (c/s)			
Be9	1.0000	ppb	-	70796.90	1.05	744.1	69272	69853	70779	70464
							70899	71065	71602	71407
							71217	71411		
Co59	1.0000	ppb	-	1052651	0.88	9252.2	1070788	1059344	1058902	1054481
							1044617	1055291	1051262	1049296
							1039008	1043517		
In115	1.0000	ppb	-	1350583	1.07	14470.2	1387990	1354391	1342678	1355775
							1346393	1343764	1343574	1351588
							1344088	1335587		
Ce140	1.0000	ppb	-	1358880	0.78	10538.3	1372294	1361915	1359379	1364263
							1352358	1363052	1364580	1367608
							1338478	1344870		
Pb208	1.0000	ppb	-	637976.3	0.34	2138.0	637639	642283	637894	638251
							637605	635288	638976	640026
							635122	636679		
Th232	1.0000	ppb	-	1039186	0.49	5053.7	1038166	1038502	1035407	1045001
							1046529	1040346	1041805	1042407
							1031801	1031891		

Isotope Ratio	Ratio	%RSD	SD	Replicates (ratio)							
Ce140O16/Ce140	0.015	1.63	0.000	0.016	0.016	0.015	0.015	0.015	0.015	0.016	0.015
				0.015	0.015						
Ba138+/Ba138	0.019	0.83	0.000	0.020	0.020	0.020	0.020	0.019	0.019	0.019	0.020
				0.019	0.019						



Details

Instrument Details

Last Read: 2023-04-19 09:24:45

Undo

Send to Instrument

Runtimes (Hrs : Mins)

Plasma: 3,051 : 1'

Turbo Pump 1 & 2: 40,812 : 40,812

Rotary Pump: 40,814 :

Component Serial Numbers & Installation Dates

Instrument:	10-5000-030-26-AR109	10/25/2017	
Control Board:	0806170600010	10/25/2017	
RF Generator:	10-5300S-AR239	10/25/2017	
RF DC Supply:	22188	4/19/2023	
Turbo Pump 1:	16872279	10/25/2017	
Turbo Pump 2:	16872278	10/25/2017	
Rotary Pump 1:	960365	2/26/2018	
Gauge 2:		2/26/2018	
Detector:	254534	10/25/2017	
Ion Optics Board:	00091C	10/25/2017	
Quad Controller:	60017090764	10/25/2017	
Mass Flow Controller Neb:	2550	10/25/2017	
Mass Flow Controller Sheath:	2523	10/25/2017	
iCRC Skimmer Cone MFC:	2016	10/25/2017	
<input checked="" type="checkbox"/> Nitrox Installed	1128	10/25/2017	

Instrument Version Info

Instrument ID & Type: PQMS Elite, 6

Firmware Build Date: Sep 7 2020 10:11:53

Firmware Version: 5.69

Control Board Version: 06

FPGA Chip Version: 200

CPLD Chip Version: 16

Optics Board Version: 7

Type and Key Status: Not AMR

Accessories

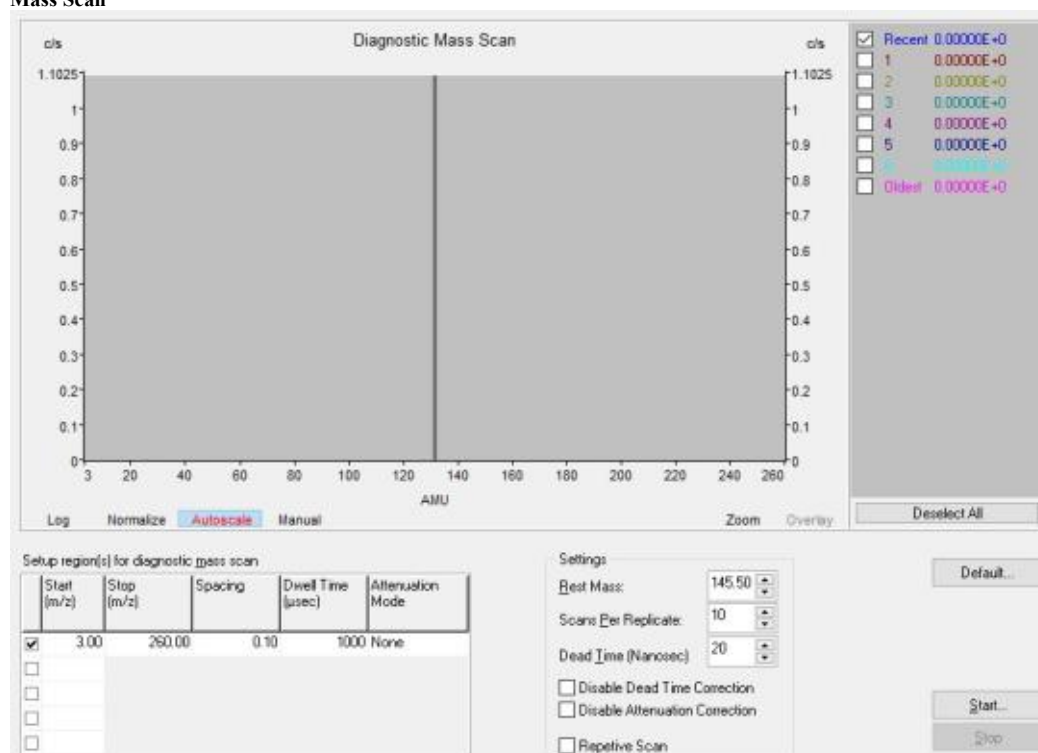
☐ Vacuum Exhaust Monitoring Installed

☒ Skimmer Installed

☐ Vacuum Gauge 2 Installed

☐ Sheath Gas MFC Installed

Mass Scan

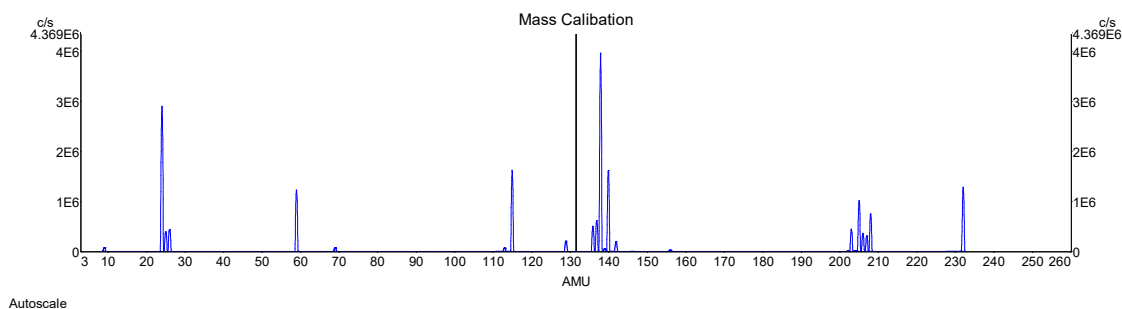


Mass Calibration

Last calibration: 2023-04-19 10:32:32

[Worksheet: C:\ProgramData\Analytik Jena\ASpect MS\Supplied Worksheets\System Setup 2023-04-18.msws]

Isotope	Exact Mass	Current Mass	Theory - Curr	Resolution	Height (c/s)	Status
Be9	9.012	9.020	-0.008	0.80	79312.66	Pass
Mg25	24.986	24.962	0.024	0.77	398418.66	Pass
Co59	58.933	58.906	0.027	0.73	1240887.38	Pass
In115	114.904	114.916	-0.012	0.72	1664403.00	Pass
Ce140	139.905	139.889	0.016	0.75	1654330.00	Pass
Pb206	205.975	206.003	-0.029	0.77	366063.66	Pass
Th232	232.038	232.032	0.006	0.80	1311951.00	Pass



	Squared Term Scale Factor	Offset
RF	15.98E-7	-61.521E-5
		29.957E-3

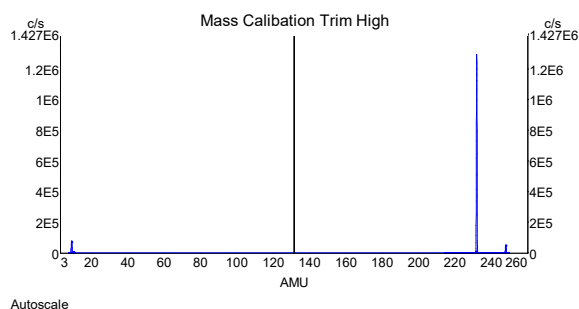
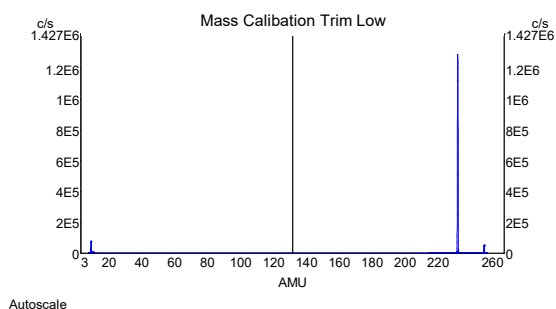
Resolution and Trim

Last modified: 2023-04-19 10:32:32

[Worksheet: C:\ProgramData\Analytik Jena\ASpect MS\Supplied Worksheets\System Setup 2023-04-18.msws]

	Offset	Scale Factor
RF	-135.926	214.11
DC	-200.202	252.684

	Isotope	Observed AMU	Width
LOW Mass	Be9	9.018	0.80
HIGH Mass	Th232	232.062	0.78

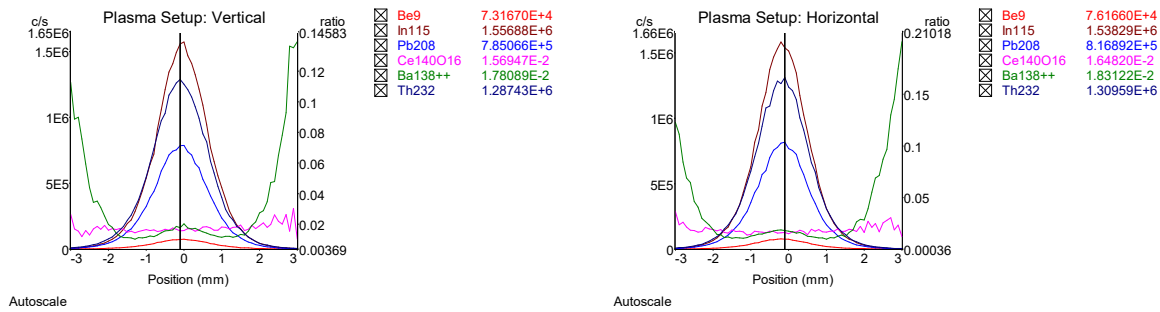


Plasma Setup

Last modified: 2023-04-19 10:28:09

[Worksheet: C:\ProgramData\Analytik Jena\ASpect MS\Supplied Worksheets\System Setup 2023-04-18.msws]

Horizontal (x) alignment: -0.10 mm, Vertical (y) alignment: -0.10 mm

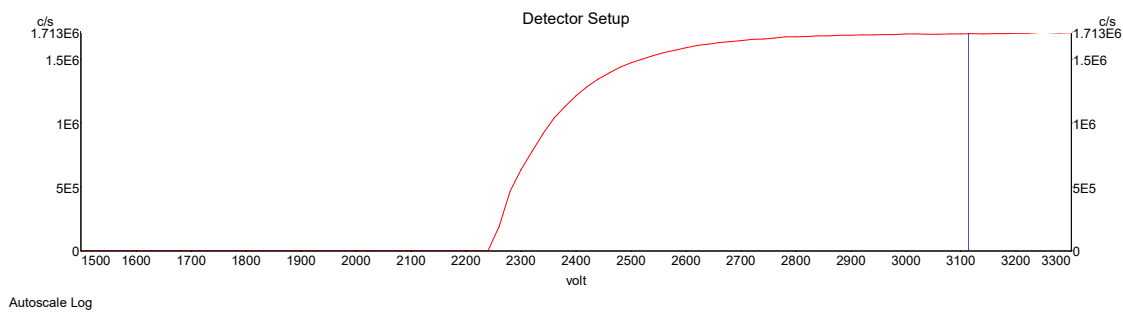


Detector Setup

Last modified: 2023-04-19 10:37:53

[Worksheet: C:\ProgramData\Analytik Jena\ASpect MS\Supplied Worksheets\System Setup 2023-04-18.msws]

Detector Voltage: 3113 volt, Scan Range From: 1500 - 3300 volt





CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Cert No. 23/2344

Site Calibration

Order No. 23060304

Customer SGS (Thailand) Limited.

1/209, 1/211 Moo 1, T. Ban Chang, A. Ban Chang Rayong 21130 Thailand.

Place of Calibration Sample Area

Description BOD Incubator

Model ICP450

Serial No. F721.0023

ID.No. I2022007

Date of Receipt Jun 21, 2023

Date of Calibration Jun 21, 2023

Environment

Temperature (Min) 24.8 °C (Max) 26.1 °C

Relative Humidity (Min) 51.4 %RH (Max) 59.9 %RH

Calibration Method

WI-17: The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49010059, Certificate No. QR23-0916, Calibrated by
Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date Apr 18, 2024.

This certificate is traceable to SI unit.

CALIBRATION CERTIFICATE

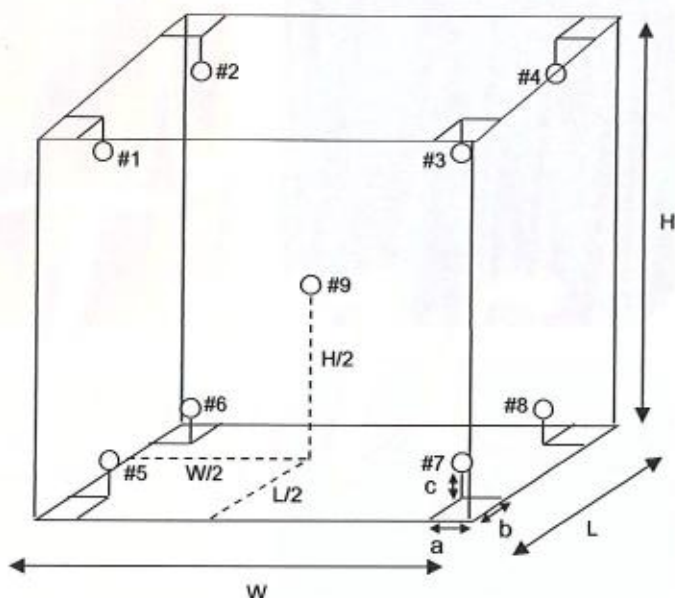
Date of Issue Jun 23, 2023

Cert No. 23/2344

Site Calibration

Order No. 23060304

Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 104 x 60 x 72 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.



CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Cert No. 23/2344

Site Calibration

Order No. 23060304

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability \pm (°C)	Uniformity (°C)	Uncertainty \pm (°C)
20.0	20.0	Position 1	20.080	0.269	0.371	0.45
		Position 2	20.006			
		Position 3	20.175			
		Position 4	20.216			
		Position 5	19.957			
		Position 6	20.114			
		Position 7	19.863			
		Position 8	20.086			
		Position 9	20.091			

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

☐ MR. PRAJUCKETCH THONGSOOKCHOTE

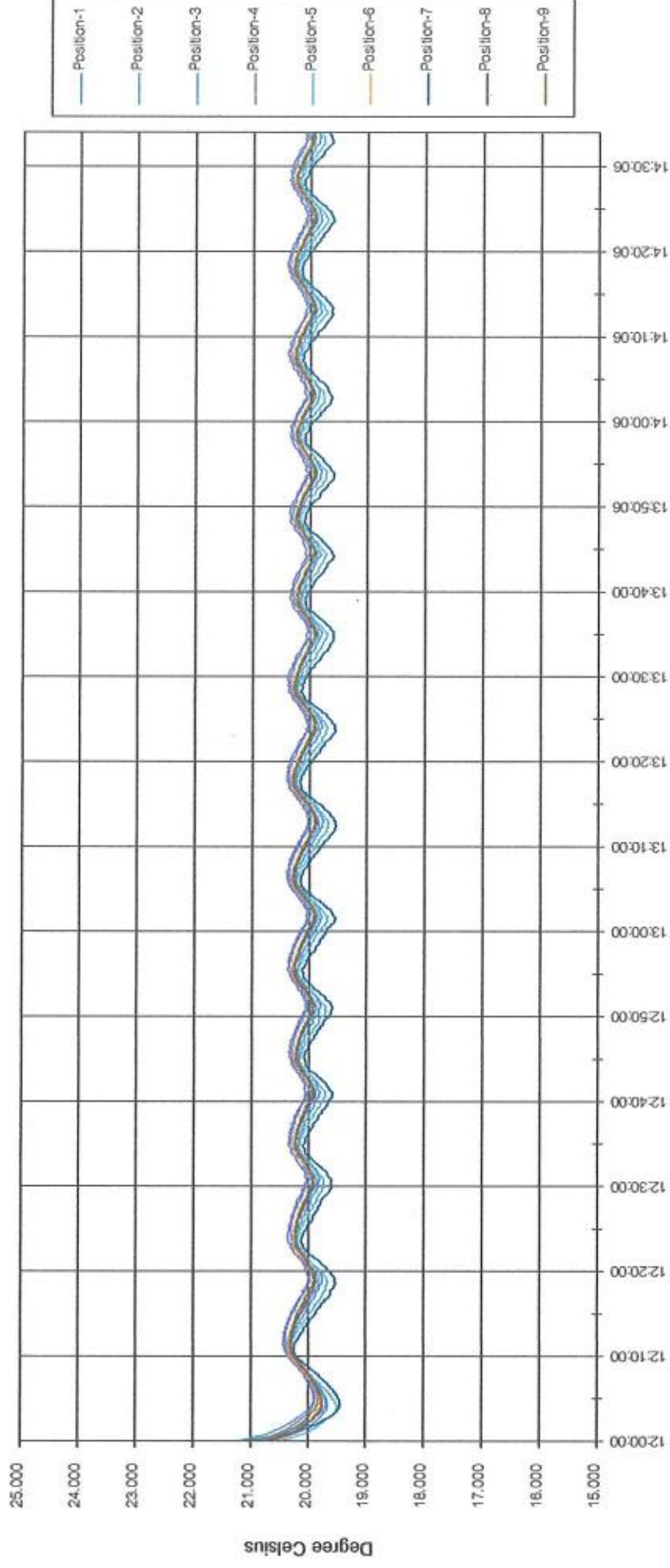
☒ MR. DAMRONG MULSING

☐ MR. JATURAPAT THONGSOOKCHOTE

Cert.No. 23/2344

BOU Incubator

Model. ICP450 S/N. F721.0023 ID.No. I2022007



Times

SGS (Thailand) limited Rayong

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. RA-4500 : 14780131

Date : 6 FEBRUARY 2023

Next due Date : AUGUST 2023

PM by :

Approved by :



Coax Group Corporation Ltd.

1131/62, 64, 325-331 Nakornchaisri road,

Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand

Tel. 02-2435263, 02-6682436 Fax. 02-2437386



NIC Mercury Analyzer Model: RA-4500

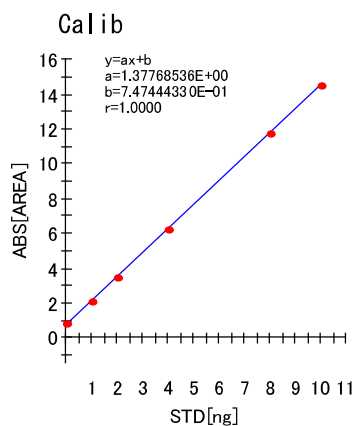
Inspection result

ITEM		STANDARD	RESULT	JUDGE
1. Self Check	1.1 Heating		PASS	OK
	1.2 Cooling		PASS	OK
	1.3 Leak		PASS	OK
	1.4 Optical system		PASS	OK
	1.5 Drift		PASS	OK
2. Analytical curve inspection(AREA)				
	2.1 No Pretreatment (Low Conc.)	Correlation coefficient (r) ≥ 0.9990	1.0000	OK
3. Repeatability (AREA)				
	3.1 No Pretreatment 100ppb, n=5		1. 98.082	ppb
			2. 104.050	ppb
			3. 102.668	ppb
			4 103.888	ppb
			5 102.666	ppb
		C.V. $\leq 5\%$	2.38%	OK
4. Blank				
		Below1.0(AREA)	0.7855	OK

Title : Preventive Maintenance RA-4500 SN:14780131
 Date : 6/2/2566
 Name : Coax Group
 Memo : Calibration Curve 0-10 ng

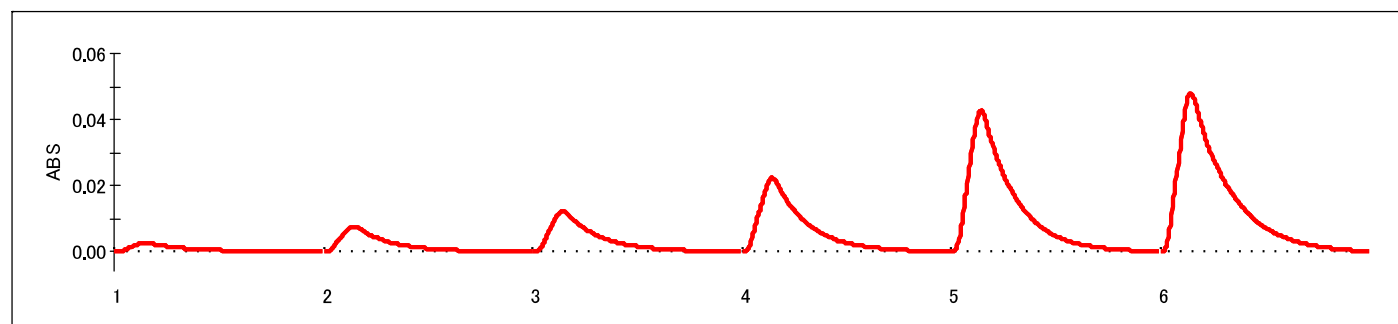
Method

Method1 (Pretreatment: without)
 (1+1) H₂SO₄ : 0.9mL
 10w/v% SnCl₂ : 0.5mL
 Measurement Time (sec) : 120sec



STD

No.	STD [ug/L]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Note
1	100.000	0.000	5.000	5.000	0.000	0.7855	0.0276	-	
2	100.000	0.010	5.000	5.000	1.000	2.1365	1.0083	0.8	
3	100.000	0.020	5.000	5.000	2.000	3.4693	1.9757	1.2	
4	100.000	0.040	5.000	5.000	4.000	6.2303	3.9798	0.5	
5	100.000	0.080	5.000	5.000	8.000	11.7452	7.9828	0.2	
6	100.000	0.100	5.000	5.000	10.000	14.5600	10.0259	0.3	

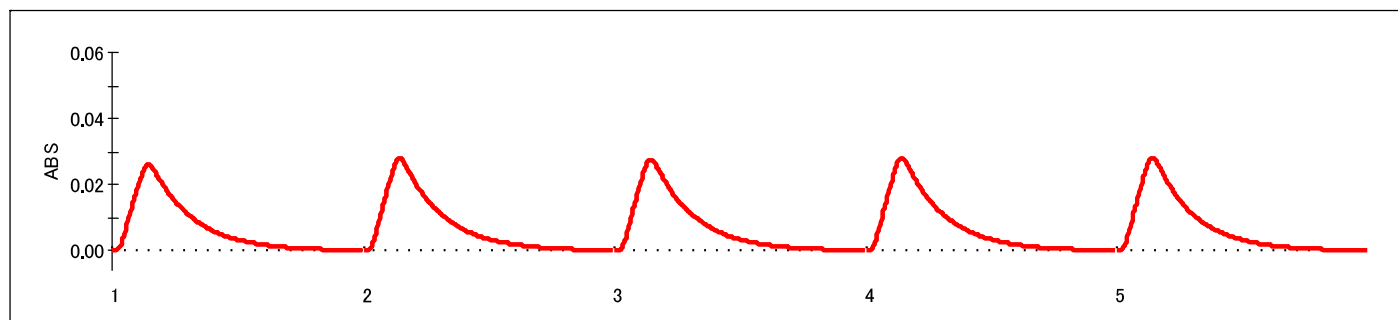


SMP

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
1	Hg100ppb	0.050	5.000	5.000	7.5038	4.9041	98.082	
2	Hg100ppb	0.050	5.000	5.000	7.9148	5.2025	104.050	
3	Hg100ppb	0.050	5.000	5.000	7.8196	5.1334	102.668	
4	Hg100ppb	0.050	5.000	5.000	7.9037	5.1944	103.888	
5	Hg100ppb	0.050	5.000	5.000	7.8195	5.1333	102.666	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	Hg100ppb	5	102.2708	2.431095	2.38



Self Check

Heat check:PASS!! (27.5degC[05:00] -> 31.6degC[03:31])
 Sensor check:PASS!! (123- 29= 94)
 Leak check:PASS!! (0.17L/min)
 Sig/Ref check:PASS!! (Sig:4.37V, Ref:4.10V)
 Drift check:PASS!! (-0.0000022 - -0.0000173 = 0.0000151)



CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Cert No. 23/2345

Site Calibration

Order No. 23060304

Customer SGS (Thailand) Limited.

1/209, 1/211 Moo 1, T. Ban Chang, A. Ban Chang Rayong 21130 Thailand.

Place of Calibration Hot Lab

Description Oven

Model UFE400

Serial No. G410.0833

ID.No. O2010002

Date of Receipt Jun 21, 2023

Date of Calibration Jun 21, 2023

Environment

Temperature (Min) 23.8 °C (Max) 25.9 °C

Relative Humidity (Min) 41.3 %RH (Max) 63.0 %RH

Calibration Method

WI-17: The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY59003190, Certificate No. QR23-1303, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date May 15, 2024.

This certificate is traceable to SI unit.

CALIBRATION CERTIFICATE

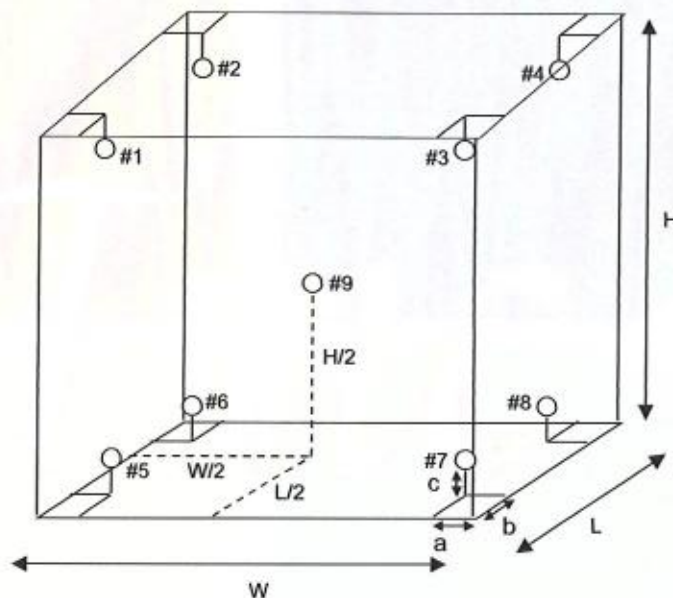
Date of Issue Jun 23, 2023

Cert No. 23/2345

Site Calibration

Order No. 23060304

Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 40 x 33 x 40 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.



CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Cert No. 23/2345

Site Calibration

Order No. 23060304

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability \pm (°C)	Uniformity (°C)	Uncertainty \pm (°C)
85.0	85.0	Position 1	85.026	0.069	0.354	0.31
		Position 2	84.969			
		Position 3	84.774			
		Position 4	84.822			
		Position 5	84.584			
		Position 6	84.571			
		Position 7	84.573			
		Position 8	84.657			
		Position 9	84.710			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability \pm (°C)	Uniformity (°C)	Uncertainty \pm (°C)
104.0	104.0	Position 1	104.144	0.080	0.455	0.32
		Position 2	104.090			
		Position 3	103.803			
		Position 4	103.860			
		Position 5	103.565			
		Position 6	103.553			
		Position 7	103.579			
		Position 8	103.653			
		Position 9	103.725			



CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Cert No. 23/2345

Site Calibration

Order No. 23060304

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
150.0	150.0	Position 1	150.660	0.119	0.757	0.40
		Position 2	150.645			
		Position 3	149.935			
		Position 4	150.091			
		Position 5	149.812			
		Position 6	149.782			
		Position 7	149.795			
		Position 8	149.820			
		Position 9	149.948			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
180.0	180.0	Position 1	180.800	0.086	0.983	0.40
		Position 2	180.771			
		Position 3	179.786			
		Position 4	180.030			
		Position 5	179.861			
		Position 6	179.830			
		Position 7	179.929			
		Position 8	179.803			
		Position 9	179.886			



CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Cert No. 23/2345

Site Calibration

Order No. 23060304

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY : D.M.

☐ MR. PRAJUCKPETCH THONGSOOKCHOTE

☒ MR. DAMRONG MULSING

☐ MR. JATURAPAT THONGSOOKCHOTE

Cert.No. 23/2345

Oven

Model. UFE400 S/N. G410.0833 ID.No. O2010002

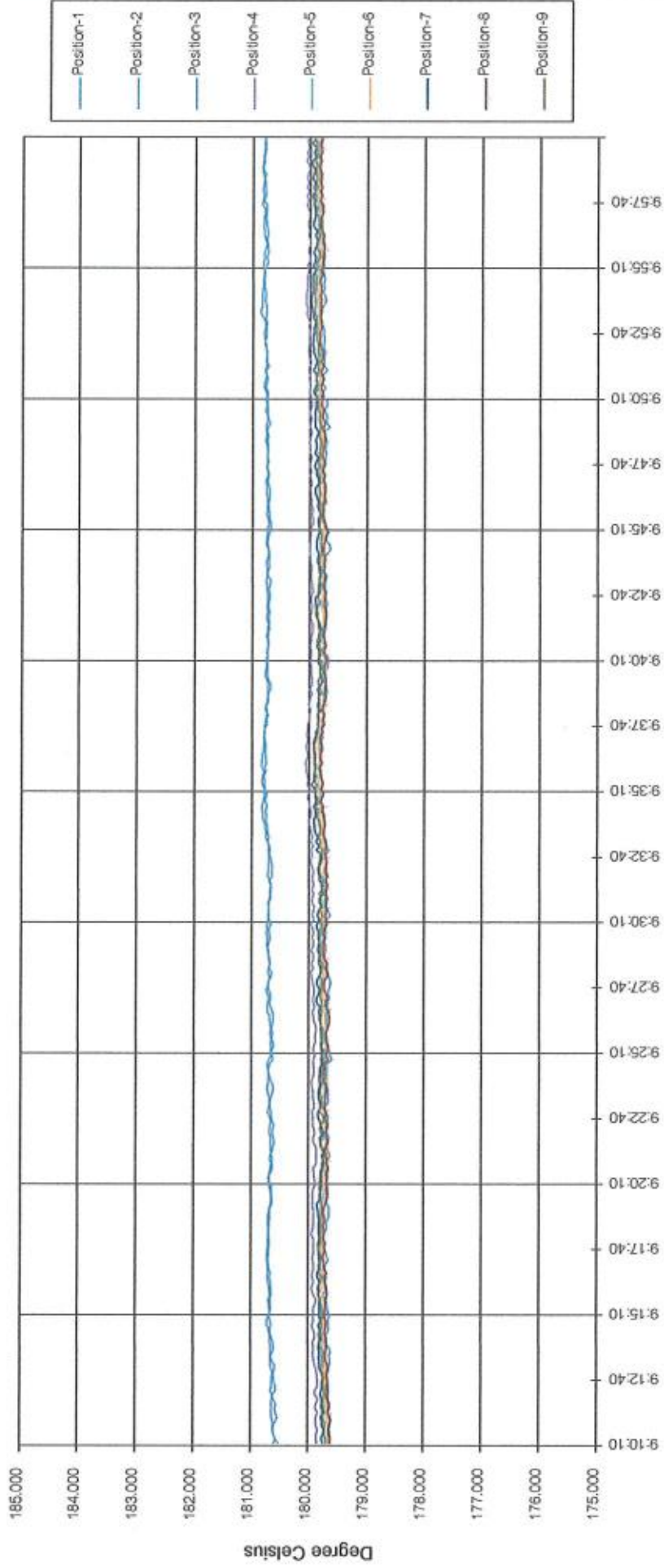


Times

Cert.No. 23/2345

Oven

Model. UFE400 S/N. G410.0833 ID.No. O2010002



Times



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH590/1

Page.: 1 of 3

Certificate of Calibration

This Certificate was issued to replace to the Certificate No.23CH590

Equipment :	pH / Conductivity Meter With Sensor
Manufacturer :	Mettler Toledo
Model :	S213
Serial No. :	B902060027
ID No. :	P2019019
Condition As-Received:	Used Item
Received Date :	09 May 2023
Calibration Date :	10 May, 16 June 2023
Reference :	2305-0290WSC-1
Submitted by :	SGS (Thailand) Limited 1/209, 1/211 Moo 1, Ban Chang, Ban Chang, Rayong 21130
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by :



Approved by :



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

Issue Date :

22 June 2023

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 0055423



Cert.No.: 23CH590/1

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

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

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

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 1.679	CPA chem	766819	17 Sep 2023
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.010	CPA chem	863835	28 Dec 2023

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

Calibration Results**Function : mV Measurement****Performing standard curve by Fluke at pH (1.68,4,7,10)**

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: B902060027	1.680	314.73	314.6	1.680	0.058	2.00
	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00
	10.000	-177.48	-177.4	10.000	0.058	2.00



Cert.No.: 23CH590/1

Page.: 3 of 3

Calibration Results**Function : pH Measurement**

Performing four buffers standard curve by using buffer nominal pH (1.68,4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 8512743	1.679	1.683	315.1	0.0045	2.00
	4.008	4.013	179.0	0.0046	2.00
	6.987	6.990	5.7	0.0085	2.00
	10.010	10.009	-169.9	0.0065	2.00

Function : Temperature Measurement**(*) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : InLab®Expert Pro-ISM

- Serial No. : 8512743

Dimension of probe;

- Length : 120 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

-o0o-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH591/1

Page.: 1 of 3

Certificate of Calibration

This Certificate was issued to replace to the Certificate No.23CH591

Equipment :	pH / Conductivity Meter With Sensor
Manufacturer :	Mettler Toledo
Model :	S213
Serial No. :	B902060027
ID No. :	P2019019
Condition As-Received:	Used Item
Received Date :	09 May 2023
Calibration Date :	11 May, 16 June 2023
Reference :	2305-0290WSC-2
Submitted by :	SGS (Thailand) Limited 1/209, 1/211 Moo 1, Ban Chang, Ban Chang, Rayong 21130
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 :

Approved by :

(✓) Malee Butkruea
() Saithip Meangmai
() Warakorn Lernagtrakul

Issue Date :

22 June 2023

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 0055424



Cert.No.: 23CH591/1

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	2211140	12 Sep 2023
2) Ref. Std. Thermometer	4982054	110RC044	2211306	27 Oct 2023

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>
25.000 $\mu\text{S/cm}$	CPA Chem	826592	09 July 2023
1413.0 $\mu\text{S/cm}$	CPA Chem	826595	09 July 2023
12.880 mS/cm	CPA Chem	826596	08 July 2023

- 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 1413.0 $\mu\text{S/cm}$** **Conductivity Electrode Serial No.: 5818450992**

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (\pm)	Coverage factor k
25.000 $\mu\text{S/cm}$	25.79 $\mu\text{S/cm}$	25.37 $\mu\text{S/cm}$	0.23 $\mu\text{S/cm}$	2.05
1413.0 $\mu\text{S/cm}$	1420 $\mu\text{S/cm}$	1414 $\mu\text{S/cm}$	9.2 $\mu\text{S/cm}$	2.00
12.880 mS/cm	12.82 mS/cm	12.78 mS/cm	0.086 mS/cm	2.00

Remark

- UUC* = Unit Under Calibration
- Cell constant = 0.556480 cm^{-1}



Cert.No.: 23CH591/1

Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab®731-ISM
- Serial No. : 5818450992

Dimension of probe;

- Length : 120 mm
- Diameter : 12 mm
- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)	Coverage factor <i>k</i>
25.0	25.002	25.1	0.098	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

-o0o-



บริษัท แอนนาไลต์ดีเคิลแลบไซน์ จำกัด
Analytical Lab Science Co., Ltd.

บริษัท เอสจีเอส (ประเทศไทย) จำกัด

1/209, 1/211 หมู่ 1 ตำบลบ้านฉาง อำเภอบ้านฉาง จังหวัดระยอง 21130

Spectrophotometer Inspection Report

Apparatus : Spectrofluorometer
Model : JASCO FP-8200
Serial No. : C020461448
Check Date : 05 May, 2023
Standard Materials : DI Water, Air

Items Test

Wavelength Repeatability of Ex/Em	Conclusion	: <input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail
Wavelength Accuracy of Ex/Em	Conclusion	: <input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail
Resolution of Ex/Em	Conclusion	: <input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail
Sensitivity	Conclusion	: <input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail
Photometric Stability	Conclusion	: <input checked="" type="checkbox"/> Passed	<input type="checkbox"/> Fail

Rescription

Sign

Date

25-5-23

25-5-23

Inspection Sheet

Date 25 พฤษภาคม 2566
 Model name JASCO
 Serial No. C020461448
 Temperature 25 C
 Humidity 50 %
 Operator Apiwat
 Comprehensive inspection

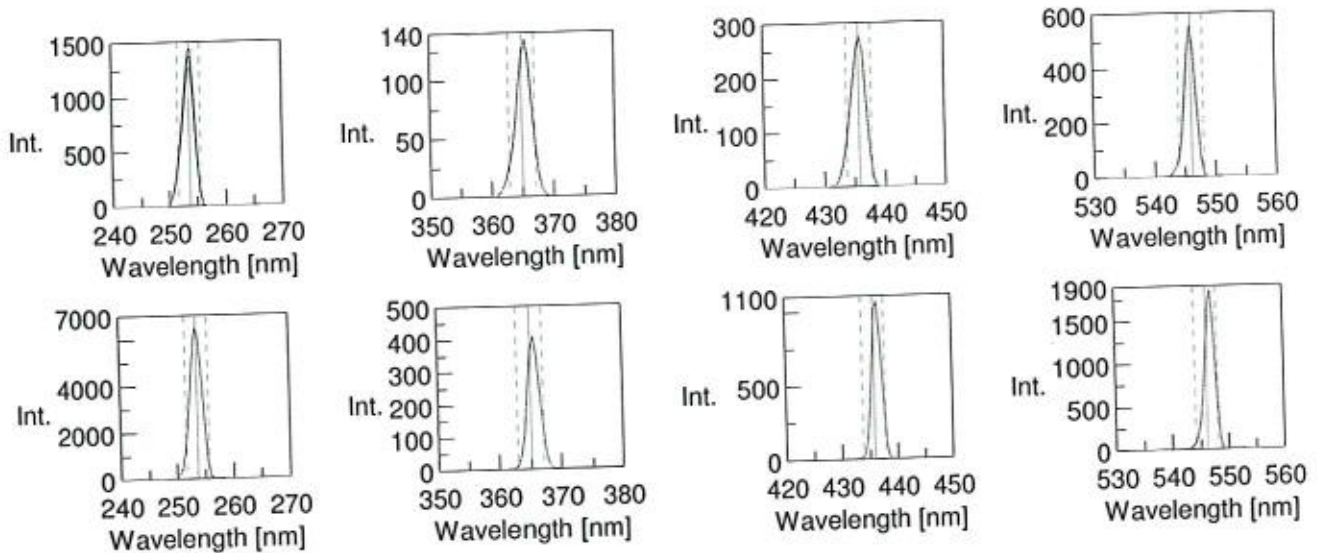
Creation

Review

Approval

Apiwat P.

Pass



Wavelength Accuracy Pass/Fail : Pass

[Excitation]

Standard 253.7 nm Criteria +/- 2.0 nm
 Average 254.00 nm, difference from standard 0.30 nm, Pass
 1: 254.0 nm, 2: 254.0 nm, 3: 254.0 nm
 Standard 365.0 nm Criteria +/- 2.0 nm
 Average 365.50 nm, difference from standard 0.50 nm, Pass
 1: 365.5 nm, 2: 365.5 nm, 3: 365.5 nm
 Standard 435.8 nm Criteria +/- 2.0 nm
 Average 436.00 nm, difference from standard 0.20 nm, Pass
 1: 436.0 nm, 2: 436.0 nm, 3: 436.0 nm
 Standard 546.1 nm Criteria +/- 2.0 nm
 Average 546.00 nm, difference from standard -0.10 nm, Pass
 1: 546.0 nm, 2: 546.0 nm, 3: 546.0 nm

[Emission]

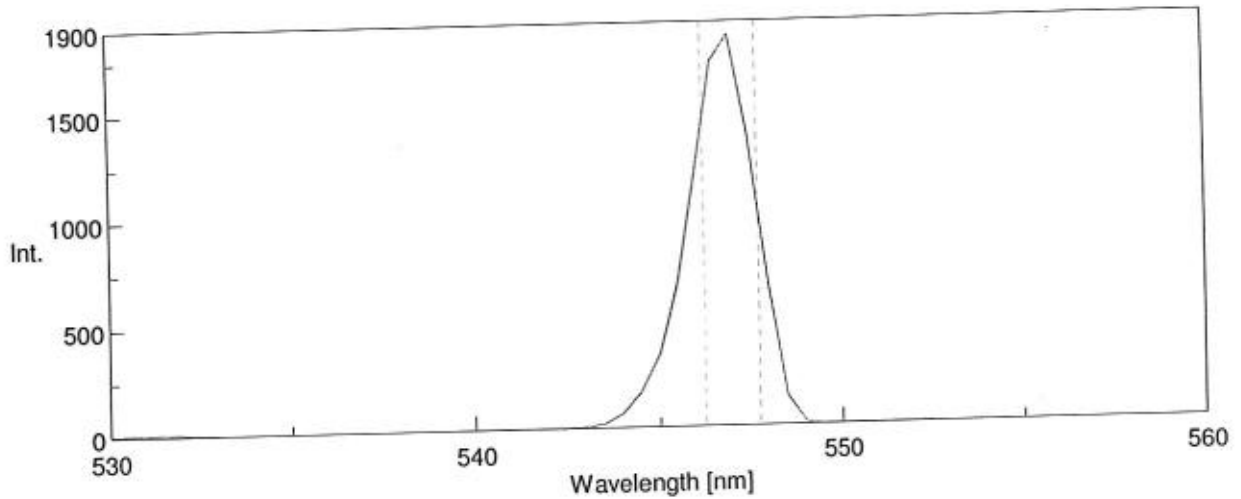
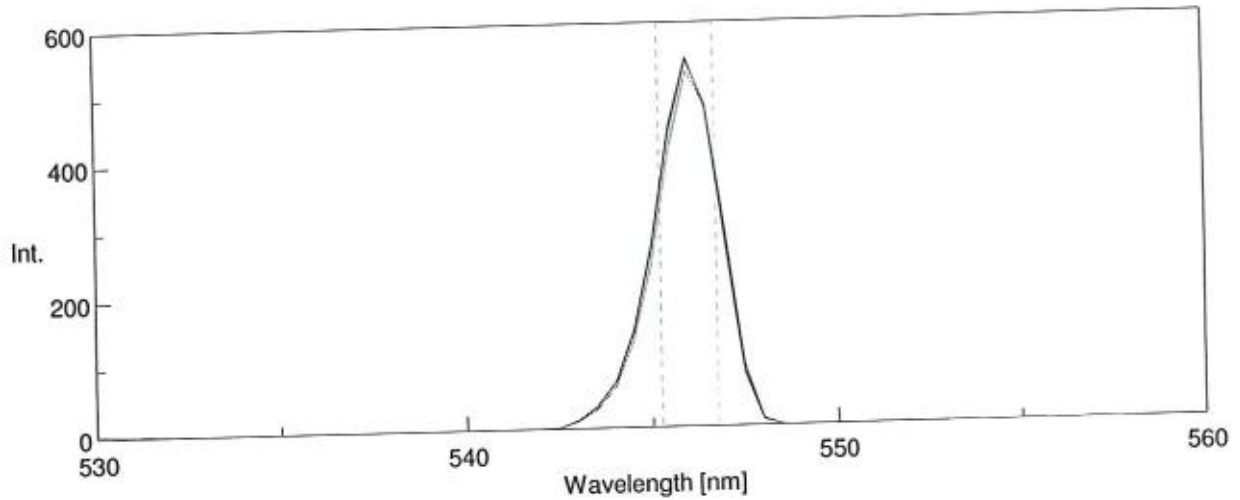
Standard 253.7 nm Criteria +/- 2.0 nm
 Average 253.50 nm, difference from standard -0.20 nm, Pass
 1: 253.5 nm, 2: 253.5 nm, 3: 253.5 nm
 Standard 365.0 nm Criteria +/- 2.0 nm
 Average 365.50 nm, difference from standard 0.50 nm, Pass
 1: 365.5 nm, 2: 365.5 nm, 3: 365.5 nm
 Standard 435.8 nm Criteria +/- 2.0 nm
 Average 436.50 nm, difference from standard 0.70 nm, Pass
 1: 436.5 nm, 2: 436.5 nm, 3: 436.5 nm
 Standard 546.1 nm Criteria +/- 2.0 nm
 Average 547.00 nm, difference from standard 0.90 nm, Pass
 1: 547.0 nm, 2: 547.0 nm, 3: 547.0 nm

Inspection Sheet

Date 25 พฤษภาคม 2566
 Model name JASCO
 Serial No. C020461448
 Temperature 25 C
 Humidity 50 %
 Operator Apiwat
 Comprehensive inspection

Creation
 Review
 Approval

Pass



Wavelength Repeatability

Pass/Fail : Pass

[Excitation]

Wavelength 546.1 nm Criteria +/- 1.5 nm
 Minimum 546.0 nm, Maximum 546.0 nm, (Max.-Min.)/2 : 0.00 nm, Pass
 1: 546.0 nm, 2: 546.0 nm, 3: 546.0 nm

[Emission]

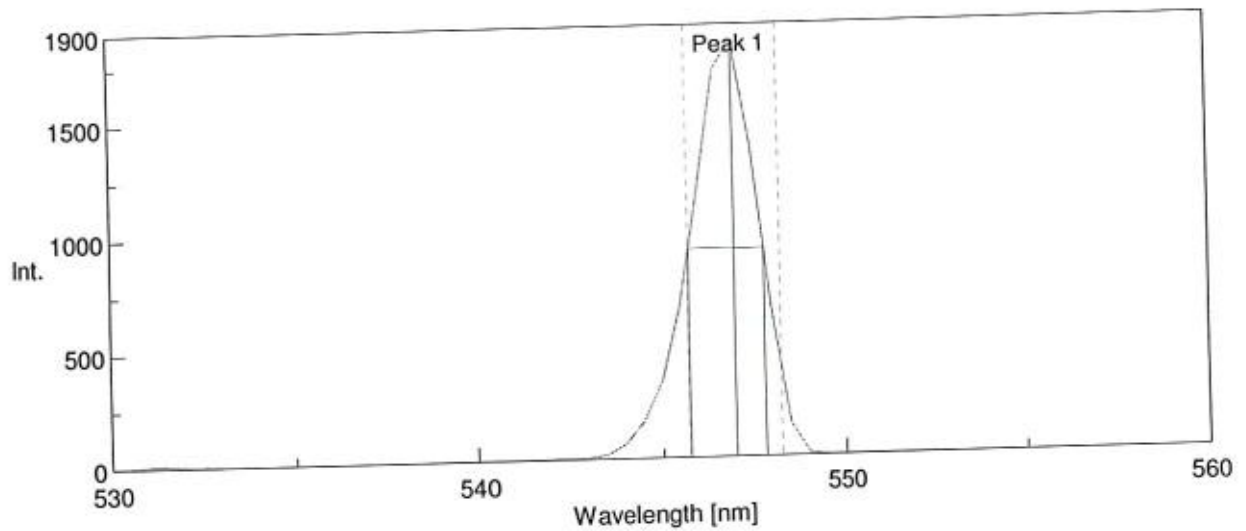
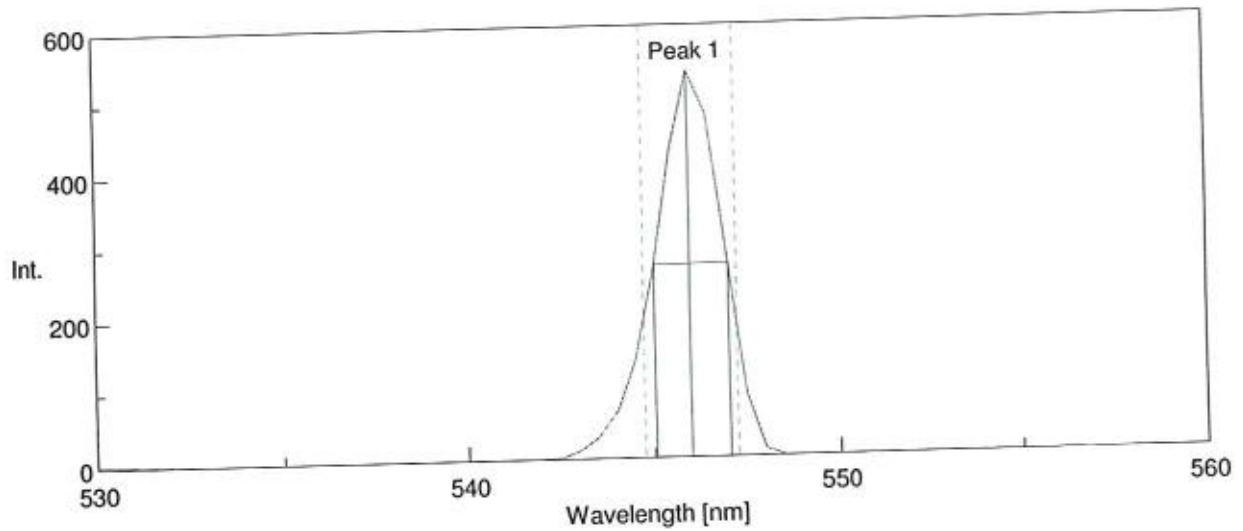
Wavelength 546.1 nm Criteria +/- 1.5 nm
 Minimum 547.0 nm, Maximum 547.0 nm, (Max.-Min.)/2 : 0.00 nm, Pass
 1: 547.0 nm, 2: 547.0 nm, 3: 547.0 nm

Inspection Sheet

Date 25 พฤศจิกายน 2566
 Model name JASCO
 Serial No. C020461448
 Temperature 25 C
 Humidity 50 %
 Operator Apiwat
 Comprehensive inspection

Pass

Creation
 Review
 Approval



Resolution

Pass/Fail : Pass

[Excitation]

Criteria : equal to or less than 2.5 nm
 Peak at 546.1 nm, FWHM : 1.99 nm, Pass

[Emission]

Criteria : equal to or less than 2.5 nm
 Peak at 546.1 nm, FWHM : 2.06 nm, Pass

Inspection Sheet

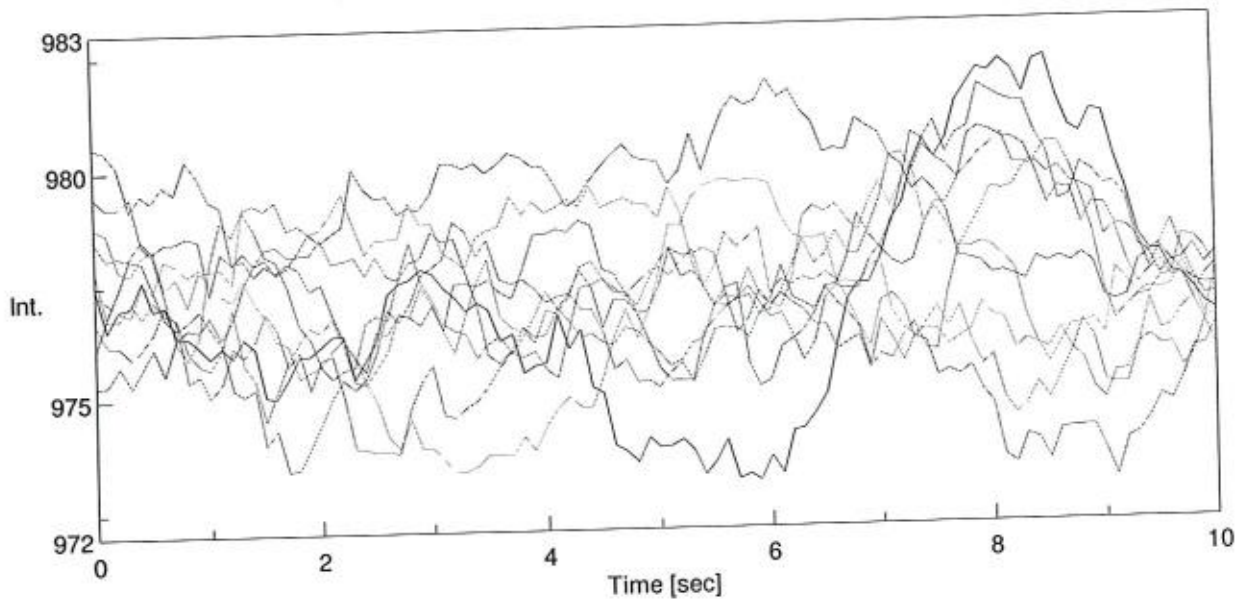
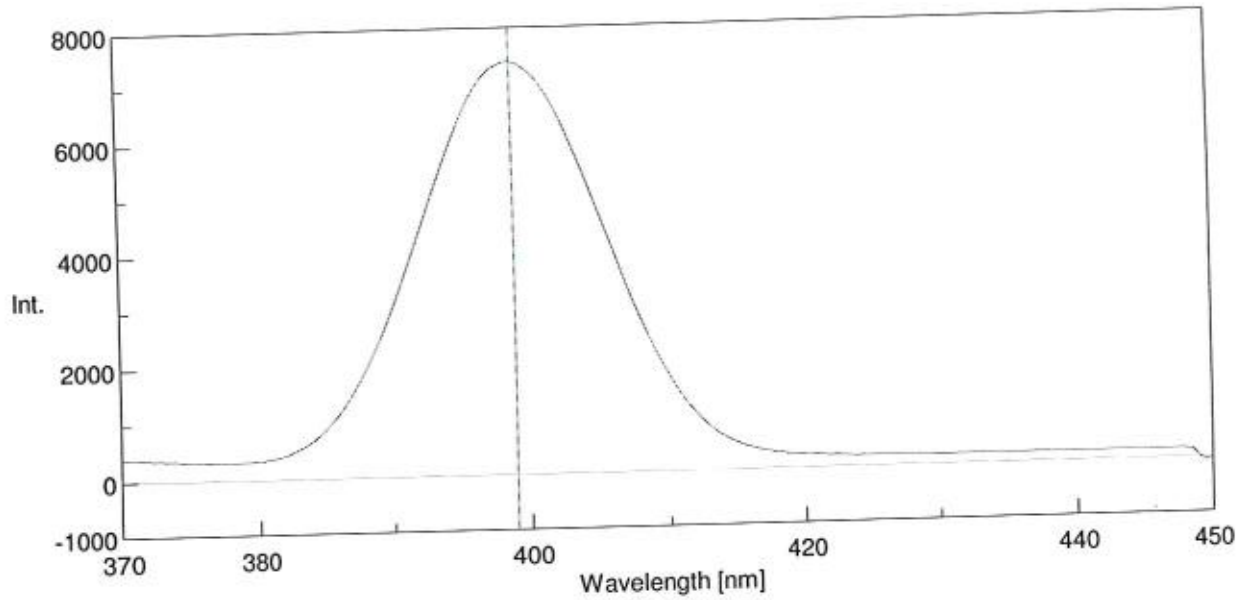
Date 25 พฤษภาคม 2566
Model name JASCO
Serial No. C020461448
Temperature 25 C
Humidity 50 %
Operator Apiwat
Comprehensive inspection

Creation

Review

Approval

Pass



Sensitivity

Pass/Fail : Pass

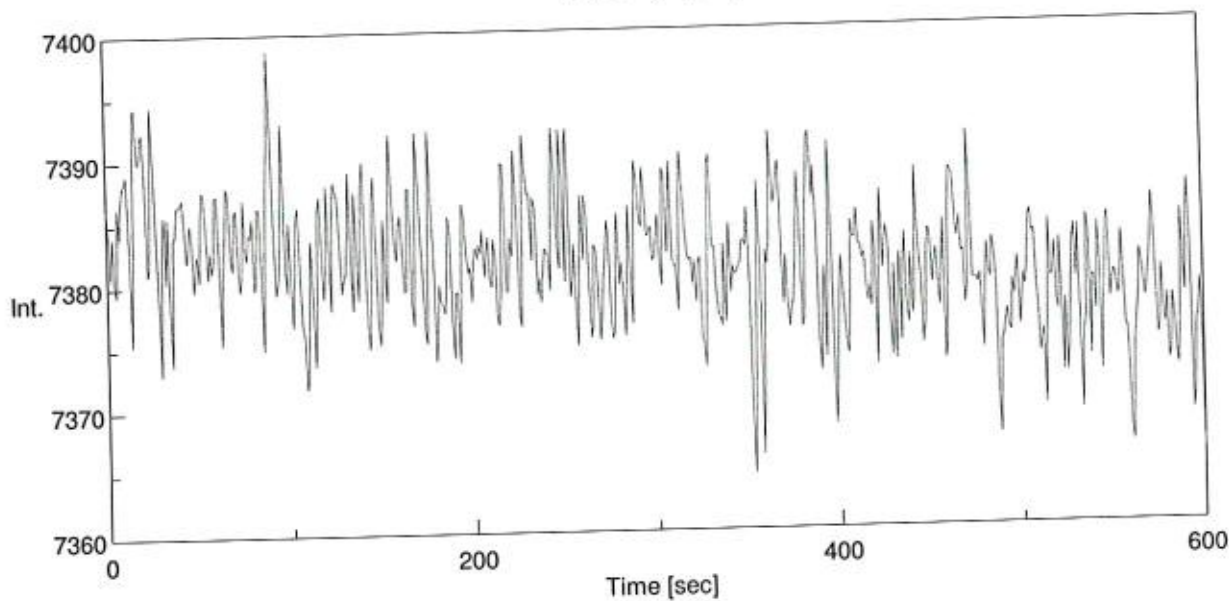
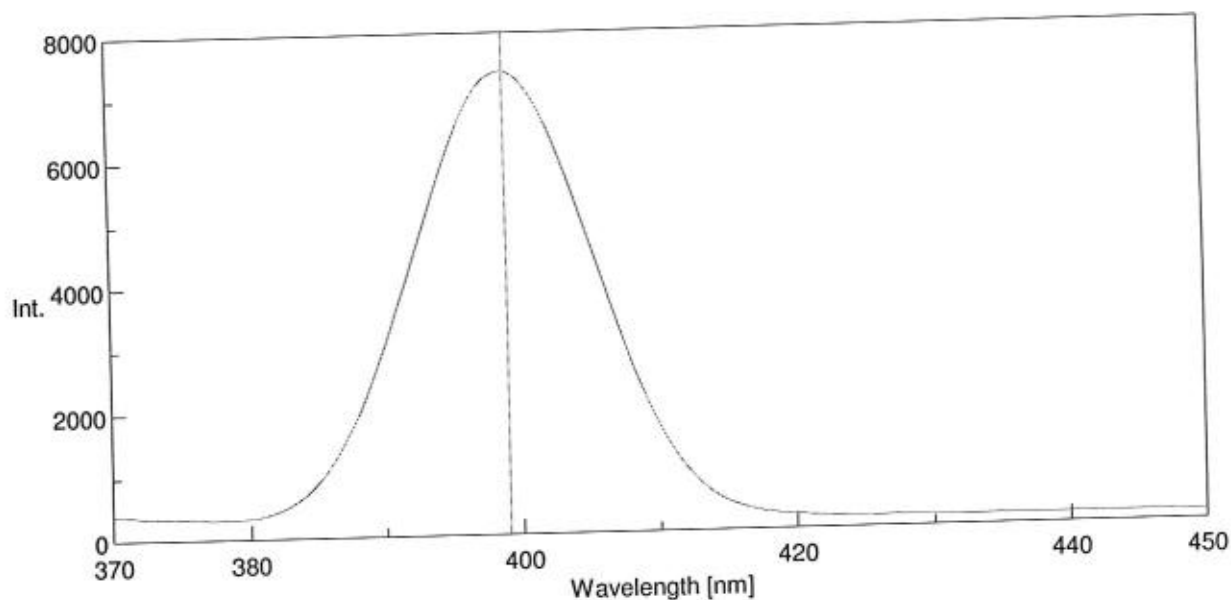
Criteria : S/N ratio equal to or greater than 500, Measured : 1205.2, Pass

Inspection Sheet

Date 25 พฤษภาคม 2566
Model name JASCO
Serial No. C020461448
Temperature 25 C
Humidity 50 %
Operator Apiwat
Comprehensive inspection

Creation
Review
Approval

Pass



Photometric Stability

Pass/Fail : Pass

Criteria : within 2.0 %, Measured : 0.54 %, Pass



CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Cert No. 23/2348

Site Calibration

Order No. 23060304

Customer SGS (THAILAND) Limited
1/209,1/211 Moo1, T.Ban Chang, A.Ban Chan, Rayong 21130 Thailand.

Place of Calibration Hot Lab

Description Water Bath

Model WNB29

Serial No. L611.0546

ID.No. W2012002

Date of Receipt Jun 21, 2023

Date of Calibration Jun 21, 2023

Environment

Temperature	(Min)	23.8	°C	(Max)	25.9	°C
Relative Humidity	(Min)	41.3	%RH	(Max)	63.0	%RH
Line Voltage	(Min)	229.2	Vac	(Max)	231.5	Vac

Calibration Method

WI-18 : The reference thermometers were placed into the bath and the measurement was based on ASTM E715-80.

The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY59003190, Certificate No. QR23-1303, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date May 15, 2024.

This certificate is traceable to SI unit.



CALIBRATION CERTIFICATE

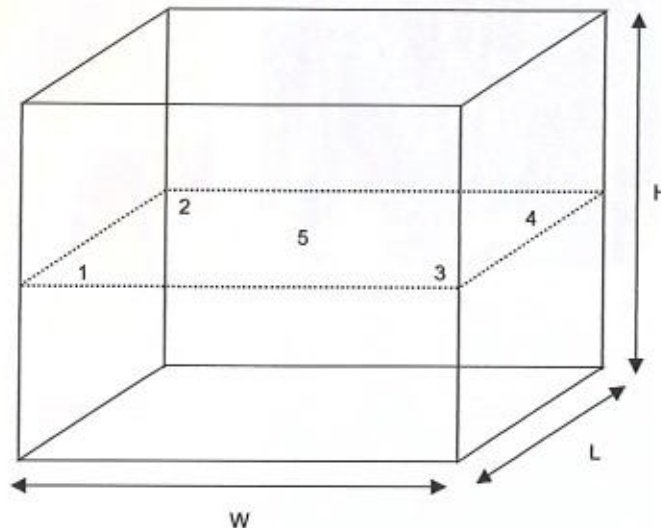
Date of Issue Jun 23, 2023

Site Calibration

Cert No. 23/2348

Order No. 23060304

Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 35 x 29 x 16 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.



CALIBRATION CERTIFICATE

Date of Issue Jun 23, 2023

Cert No. 23/2348

Site Calibration

Order No. 23060304

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability \pm (°C)	Uniformity (°C)	Uncertainty \pm (°C)
60.0	60.0	Position 1	59.937	0.066	0.205	0.16
		Position 2	59.978			
		Position 3	60.024			
		Position 4	60.054			
		Position 5	60.051			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability \pm (°C)	Uniformity (°C)	Uncertainty \pm (°C)
[[[101.2	Position 1	100.971	0.382	0.485	0.50
		Position 2	100.903			
		Position 3	100.798			
		Position 4	101.033			
		Position 5	100.995			

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

- ☐ MR. PRAJUCKPETCH THONGSOOKCHOTE
☒ MR. DAMRONG MULSING
☐ MR. JATURAPAT THONGSOOKCHOTE

Cert.No. 23/2348

Water Bath
Model. WNB29 S/N. L611.0546 ID.No. W2012002

